AUTOMOTIVE INDUSTRIES

Founded 1895

Vol 75, No. 24

December 12, 1936

Car Plants Regain Stride

Despite Midland Strike Setback, Production Is Expected to Exceed Last December's Record

By Harold E. Gronseth

All the cars that the automobile manufacturers can build will be turned out this month and if they can escape further interruptions to operations, December undoubtedly will score a new high mark for production. With good going from now on, the plants that were closed as a result of the Midland Steel strike will be able to make up at least a part of the production they lost, estimated at approximately 20,000 units.

But it does not now seem probable that the industry will attain the half million mark this month as earlier forecast. Barring further set-backs, however, it should have little difficulty in exceeding the total of 418,317 units for the corresponding month last year which was a December record. The retarding effect of strikes even on the November production is seen in the closer estimate that now can be made for that month. The Automobile Manufacturers Association reports that November shipments of its members was 337,446 units which indicates a total for the entire industry of 398,000 units, or considerably under most of the published estimates.

It shows that on its new models the industry, by the end of November, had not attained the rate of operations in effect a year ago when the November output was 408,550 units. But with a total of 4,090,000 cars and trucks for 11 months this year, production is 24 per cent ahead of the corresponding period in 1935. The manufacturers are still far behind in orders that have been piling up since the introduction of 1937 models and pobably will not be caught up until the end of January since many are hard pressed to keep abreast of current orders. No voluntary let-down such as occurred at midwinter last year is in prospect even though unfavorable weather temporarily checks retail sales. Some of the curtailment in output last January and

(Turn to page 812, please)

Keystone photo

Car owners lining up for new license plates are boosting U. S. registrations to a record high

This Week

Some mechanical details of the new Ford are shown on page 820.

Several new ideas on bus body construction are given on page 822.

Drawings of the Oldsmobile Eight engine are on pages 825 and 826 while on the following page are some more specifications of 1937 passenger cars.

"Metallurgy of Tractor Axles" is the title of an article beginning on page 829.

Registration Count at Record Peak

Preliminary Survey Shows Total Vehicles in U. S. at End of 1936 Will Near 28½ Million

By Marcus Ainsworth*

More motor vehicles will be registered in the United States by the end of the year 1936 than in any previous year. This fact is made evident by a survey just completed by AUTOMOTIVE INDUSTRIES, which places the preliminary total for the year at 28,424,077 vehicles, while advancing the possibility that official figures, available several months from now, may push the total to 28½ million on the basis of previous statistical experience with these data.

This survey has been made possible by the cooperation of the motor vehicle commissioners of the various states and is the result of actual returns to date plus an estimate for the balance of the year.

*Statistician, AUTOMOTIVE INDUSTRIES.

Total registrations in this country increased each single year from 1895 to 1930, the year following the peak year in sales. Declines were registered during the subsequent three years. An increase in 1934 brought the total back to a figure beyond the 1928 mark, and another increase last year returned the total close to the 1929 figure.

The previous high of 26,657,072 was reached during 1930, but according to our preliminary figures this record has now been passed by at least 1,750,000, and the registrations of 1935 which amounted to 26,147,286 have been increased by about nine per cent, or 2,278,000 units. Of the 28 million vehicles registered this year 24,459,940 are passenger cars and 3,964,137 are trucks and buses. Commercial vehicles show the largest gain over last year with approximately 11 per cent, while

the passenger car increase amounts to about eight per cent.

Several reasons combine to account for this phenomenal increase in registrations this year.

It is estimated that approximately 3,300,000 new passenger cars will be registered throughout 1936, a volume of sales exceeded only by the 3,880,000 of 1929. It is also estimated that to these will be added 620,000 commercial vehicles, a new high mark in this field, the best previous year being 1929, with 527,000 new registrations. This means that very close to 4,000,000 new vehicles have been distributed throughout the country this year, and these alone would boost the total registrations to a new high if no account were taken of cars that were junked throughout 1935.

In addition, it has been generally known that for the past few years many cars and trucks have been in storage of some form or other. The change for the better in general economic conditions during the current year has allowed many multiple car owners to have all their cars in use, and the truck fleet operator has been forced to operate all of his vehicles even though they might have been lying idle for several years.

In states where the license plate follows the car it is quite possible that there has been considerable increase throughout the year in junking cars or trucks that had already been registered with 1936 plates. In that case, for every car or truck that was junked during the year and replaced by a new vehicle, there would be duplicate registrations but only one-half of this number would represent cars actually in use.

Utah indicated the largest percentage increase over 1935 with 26.8 per cent, followed by the District of Columbia with 26.6, Nebraska 21.9, Indiana 20.8, New Mexico 17.8, Connecticut 14.9, California 13, and Alabama and Montana, both with 12 per cent. From this it can be seen that the increases are general throughout the country and are not confined to any one section such as the industrial east or the agricultural west.

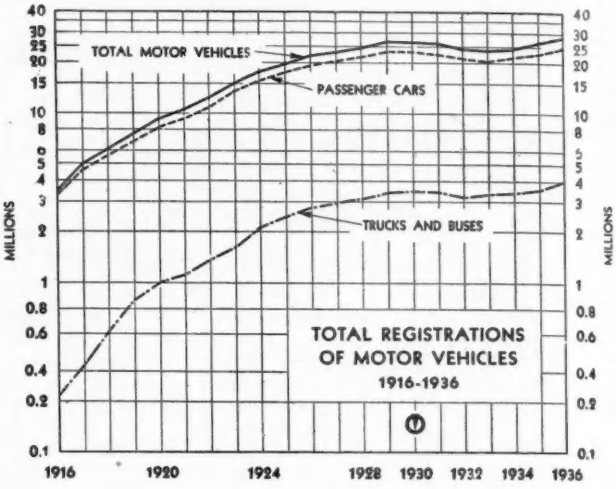


Chart showing the registration of motor vehicles during the period 1916-1936.

Estimated Motor Vehicle Registrations

	Passenger Cars 1936	Trucks & Buses 1936	TOTAL MOTOR VEHICLES 1936	TOTAL MOTOR VEHICLES 1935	Percent Increase 1936 over 1935
Alabama ‡	226,444	44,698	271,142	242,204	12.0
Arizona	101,281	21,905	123,186	103,122	9.7
Arkansas	180,000	45,000	225,000	211,103	6.8
California§	2,280,000	145,000*	2,425,000	2,150,740	13.0
Colorado	277,764	29,894*	307,658	284,578	8.3
Connecticut	380,000	60,000	420,000	366,115	14.9
Delaware	49,895	10,140	60,035	56,488	6.5
District of Columbia	192,668	22,098	214,766	170,907	26.6
Florida	318,431	64,291	382,722	356,244	7.6
Georgia	339,000	73,545*	412,545	394,096	4.7
Idaho	102,000	22,400	124,400	116,500	7.0
Illinois	1,465,000	217,000	1,682,000	1,533,752	9.9
Indiana	815,000	155,000	970,000	804,900	20.8
Iowa	646,170	84,214	730,384	696,535	4.9
Kansas	500,000	85,000	585,000	553,106	5.8
Kentucky	315,000	53,000	368,000	343,150	7.2
Louisiana	224,800	74,000*	298,800	273,050	9.7
Maine	150,000	41,000	191,000	179,275	6.8
Maryland	295,641	54,431	350,072	344,581	1.6
Massachusetts	725,640	104,561	830,201	785,672	5.8
Michigan	1,239,000	140,000	1,379,000	1,239,431	11.5
Minnesota	665,000	114,245	779,245	728,711	7.1
Mississippi	164,000	35,500	199,500	186,289	7.1
Missouri	680,000	125,000	805,000	766,369	5.1
Montana	128,000	39,400	167,400	149,712	12.0
Nebraska	435,000	61,310	496,310	407,903	21.9
Nevada	30,600	7,900	38,500	35,435	8.9
New Hampshire	97,500	23,500	121,000	113,725	6.6
New Jersey	815,272	135,003	950,275	887,611	7.1
New Mexico	85,000	22,600	107,600	91,436	17.8
New York	2,100,000	364,400	2,464,400	2,354,842	5.0
North Carolina	437,000	63,000	500,000	462,997	8.2
North Dakota	138,000	30,100	168,100	164,217	2.5
Ohio	1,600,000	170,000	1,770,000	1,686,877	5.1
Oklahoma	440,000	86,500	526,500	502,100	5.0
Oregon	275,000	54,750	329,750	297,112	11.0
Pennsylvania	1,636,079	284,145	1,920,224	1,745,404	10.1
Rhode Island	140,483	19,958	160,441	149,906	7.0
South Carolina	220,000	31,500	251,500	235,919	6.8
South Dakota	155,720	29,046	184,766	179,250	3.3
Tennessee	332,000	44,000	376,000	352,261	7.0
Texas	1,200,000	304,000	1,504,000	1,366,017	10.2
Utah	113,000	22,685	135,685	107,261	26.8
Vermont	75,000	8,712	83,712	80,671	4.0
Virginia	340,700	63,100	403,800	378,014	6.9
Washington	405,000	72,000	477,000	453,871	5.1
West Virginia †	216,852	37,520	254,172	240,012	6.0
Wisconsin	670,200	151,086	821,286	749,602	9.8
Wyoming	61,000	16,000*	77,000	70,215	9.8
TOTALS	24,459,940	3,964,137	28,424,077	26,147,296	8.8

* Buses included with passenger cars.
† For fiscal year ending June 30, 1936.
‡ For fiscal year ending Sept. 30.
§ Passenger cars include approximately 120,000 light commercial vehicles

New York maintains first place in registrations with 2,464,000 vehicles. California comes a close second with 2,425,000 followed by Pennsylvania, Ohio, Illinois, Texas and Michigan in the order named, all with registrations well over one million vehicles.

Based on estimates of population as of July 1 of each year by the Bureau of Census there were 4.62 persons per motor vehicle in 1930. At that time it was estimated that there were slightly over 123 million persons in the United States. Today with a population of 128,400,000 there are only 4.52 persons per motor vehicle.

A summary of motor vehicle registration for 1936 by States, broken down into passenger cars and trucks and buses combined, and total motor vehicles, as compared with the total for 1935, is given herewith.

On the next page appears a cable showing gasoline consumption by states for the first nine months of this year as compared with last.

Burgess - Norton Votes Bonus, Extra Dividend

The board of directors of the Burgess-Norton Mfg. Co., Geneva, Ill., manufacturers of automotive parts, on Nov. 27 declared a second semi-annual dividend of $2 per share on the preferred stock. This, with the $2 per share paid in August, totals $4, the amount of the regular preferred stock dividend. An extra dividend of $2 per share on the preferred stock was also declared, making total dividends for the year of $6 per share on the preferred stock.

A dividend of $3 per share was declared on the common stock. Dividends are payable Dec. 15, on stock of record as of Dec. 5.

Wage increase was granted to all employes on July 1, and the management announced Dec. 1, that further adjustments would be made in the payroll schedule on Jan. 2. Operations are being conducted through part of the plant on a 24-hour basis, and other departments are running from 12 to 16 hours per day. Sufficient orders are on hand to continue this schedule for the next 90 days.

New Chrysler Director

Juan Trippe, Pan American Airways President, Elected to Board

Walter P. Chrysler, chairman of the board of Chrysler Corp., announced this week that Juan T. Trippe, president and general manager of Pan American Airways, has been elected a member of the board of directors of Chrysler Corp.

Mr. Trippe is one of the founders of the Pan American Airways System and has been head of it since its organization 10 years ago. Its operation began in 1927, with a 90-mile airline, 3 airplanes and 21 men. Today Pan American Airways has more than 42,000 miles of airlines, linking the United States with 41 countries and colonies, 149 modern airliners and more than 3300 employes.

Born in 1899 in Sea Bright, N. J., Mr. Trippe attended the Hill School before entering Yale University. He left Yale during the World War to enlist in the U. S. Naval Air Service. When he resigned at the end of the war and returned to Yale, he had become a qualified naval pilot with an Ensign's commission. He was graduated in 1920. For the next three years he was associated with a Wall Street banking house, which he left in 1923 to organize the Long Island Airways, one of the pioneer air transport companies in the United States. Two years later he aided in the organization of the Colonial Air Transport Co., the first air mail contractor, remaining with that company until 1927, when Pan American Airways was formed.

Frank W. Ruggles

Frank W. Ruggles, former president of the Republic Truck Co., died at his home at Alma, Mich., Dec. 7. He had been ill since last summer. From 1912 to 1920 Mr. Ruggles was one of the outstanding figures of the automobile industry. During the war his company was the largest exclusive manufacturer of trucks in the world and made the first low-priced trucks. Mr. Ruggles sold his interest in Republic in 1920 and organized the Ruggles Motor Truck Co., of Saginaw, Mich. He was later president of the Northern Wheel Co., of Alma and St. Louis. He leaves a wife and son, Read S. Ruggles, a Cleveland manufacturer.

Juan T. Trippe

president of the Pan American Airways System, who was elected a director of the Chrysler Corp.

October Parts Employment 8.4% Higher Than in 1929

Productive employment in the 48 plants used as representative of the original equipment division of the automotive parts and equipment manufacturing industry showed a gain for the four-week period ending in October of 13.6 per cent over September, and 5.2 per cent over October, 1935. Employment figures for October show that 8.4 per cent more employes were at work during that period than the average for 1929.

Average employment for the first 10 months of 1936 was 3 per cent greater than the average for the first 10 months of 1929.

The payroll for this division reached a new high for 1936 with a total of $7,800,000 being paid out during the four-week period. Each factory worker averaged $27.61 per week as against $25.47 for the similar period in 1935, and $24.66 in September of this year.

The average factory hourly rate was 67.4 cents per hour, 25.5 per cent more per hour per man than the low reached in February of 1934.

Gasoline Consumption by States*

	MONTH OF			9 MONTHS ENDING WITH	
	Aug., 1936 Gal.	Sept., 1936 Gal.	Sept., 1935 Gal.	Sept., 1936 Gal.	Sept., 1935 Gal.
Alabama	18,243,000	18,602,000	14,971,000	147,722,000	126,392,000
Arizona	7,937,000	8,075,000	6,703,000	70,088,000	59,278,000
Arkansas	14,430,000	14,388,000	12,723,000	112,245,000	103,955,000
California	139,901,000	141,024,000	134,162,000	1,210,614,000	1,095,158,000
Colorado	21,685,000	19,391,000	17,096,000	154,950,000	137,476,000
Connecticut	29,484,000	27,495,000	25,735,000	218,925,000	201,909,000
Delaware	5,471,000	4,767,000	4,017,000	37,820,000	33,783,000
District of Columbia	11,451,000	10,985,000	9,858,000	93,656,000	86,108,000
Florida	22,390,000	23,081,000	20,190,000	233,218,000	221,461,000
Georgia	27,443,000	25,972,000	22,472,000	216,662,000	197,620,000
Idaho	10,438,000	9,306,000	7,910,000	64,484,000	54,182,000
Illinois	113,971,000	105,238,000	96,300,000	882,239,000	794,622,000
Indiana	52,812,000	53,757,000	47,394,000	415,659,000	370,366,000
Iowa	43,912,000	42,301,000	40,013,000	342,727,000	314,370,000
Kansas	41,094,000	42,631,000	40,759,000	344,868,000	317,088,000
Kentucky	22,069,000	21,558,000	18,551,000	168,075,000	149,415,000
Louisiana (a)					
Maine	17,111,000	14,452,000	12,497,000	101,629,000	91,102,000
Maryland	24,040,000	23,187,000	19,440,000	181,067,000	161,610,000
Massachusetts	65,905,000	77,932,000	55,942,000	503,712,000	453,925,000
Michigan	97,906,000	91,689,000	78,265,000	735,877,000	655,887,000
Minnesota	50,389,000	48,432,000	44,458,000	359,087,000	331,561,000
Mississippi	14,517,000	14,091,000	13,515,000	117,377,000	105,079,000
Missouri	50,773,000	51,152,000	47,211,000	413,773,000	379,121,000
Montana	12,415,000	10,641,000	9,284,000	85,445,000	73,615,000
Nebraska	22,284,000	22,035,000	21,847,000	173,049,000	172,143,000
Nevada	3,776,000	3,494,000	3,011,000	25,752,000	22,781,000
New Hampshire	9,992,000	8,345,000	7,365,000	61,808,000	56,207,000
New Jersey	77,540,000	69,457,000	71,052,000	660,757,000	616,456,000
New Mexico	7,902,000	6,414,000	5,757,000	56,126,000	48,431,000
New York	178,486,000	162,916,000	143,221,000	1,282,365,000	1,202,549,000
North Carolina	32,635,000	32,575,000	27,745,000	253,104,000	224,275,000
North Dakota	11,611,000	12,030,000	13,903,000	84,541,000	95,347,000
Ohio	110,706,000	107,696,000	95,672,000	864,716,000	780,152,000
Oklahoma	31,098,000	34,516,000	30,470,000	276,421,000	247,408,000
Oregon	23,140,000	22,555,000	18,097,000	163,603,000	139,690,000
Pennsylvania	125,026,000	117,898,000	103,479,000	944,050,000	876,207,000
Rhode Island	12,120,000	11,141,000	9,652,000	87,455,000	81,852,000
South Carolina	15,227,000	14,961,000	12,171,000	119,638,000	106,723,000
South Dakota	10,680,000	10,892,000	11,541,000	85,508,000	92,209,000
Tennessee	25,145,000	27,573,000	20,288,000	188,229,000	165,913,000
Texas	99,425,000	93,356,000	80,587,000	807,977,000	712,110,000
Utah	8,424,000	8,291,000	6,589,000	61,100,000	52,586,000
Vermont	7,280,000	6,550,000	5,448,000	44,962,000	39,147,000
Virginia	30,889,000	29,940,000	24,794,000	232,593,000	208,778,000
Washington	33,001,000	31,629,000	28,277,000	241,683,000	209,402,000
West Virginia	18,029,000	17,870,000	14,604,000	134,691,000	118,385,000
Wisconsin	51,292,000	49,318,000	42,468,000	374,076,000	331,156,000
Wyoming	6,919,000	6,468,000	5,200,000	44,419,000	37,647,000
Total 47 States and Dist. of Columbia.	1,868,394,000	1,811,087,000	1,600,644,000	14,480,342,000	13,150,595,000
Daily Average	60,271,000	60,370,000	53,355,000	52,848,000	48,171,000
Change from previous year:					
Total change		+210,443,000		+1,329,747,000	
Percentage change in Daily Average		+13.15%		+9.71%	

* Compiled by the American Petroleum Institute.
(a) Not available on comparable basis at time of publication.

Huge Attendance at ASI Show

Previous Records Broken by Parts Exhibit; Associations Hold Annual Meetings, Elect Officers

By George Applegren

With attendance marks for other years shattered, Chicago, this week, became the Mecca of the automotive accessory world when the NSPA, MEWA and MEMA held their annual meetings, and combined to stage the ASI show at Navy pier. Hotels were filled to overflowing and optimism over the prospects for 1937 was measurably higher than a year ago.

The NSPA elected Leo F. Hunderup, assistant general manager of the Van Norman Machine Tool Co., of Springfield, Mass., as its president. V. C. Hossellman, of the Siferd-Hossellman Company, of Lima, Ohio, was elected senior vice-president; and L. G. Matthews, general sales manager for Sealed Power Corp., of Muskegon, Mich., was elected junior vice-president.

Two new manufacturer directors were elected to fill the places of those whose terms had expired. They were: J. Harvey Williams, president of J. H. Williams and Co., of New York City; and T. Latimer Ford, sales manager of American Hammered Piston Ring division of Koppers Co., of Baltimore, Md. C. C. Bradford, president of the Eaton Products Co., Inc., of Cleveland, was elected to fill the vacancy created by the resignation of Frank C. Kip, president of Automotive Thrust Bearing Corp., of Chicago.

New directors elected to represent the wholesalers division were: H. F. Wible, vice-president, Air-Land Motor Parts Co., Greensburg, Pa.; R. B. McLure, vice-president, Parts Service Corp., Montgomery, Ala.; and David Ruskin, president, Sanders and Ruskin, Inc., of New York City.

All of the groups held business meetings on Monday and Tuesday with the ASI show opening on Wednesday. It is scheduled to run through Sunday.

Featured speaker at the NSPA convention was Boake Carter, radio commentator and newscastor, who talked on "What Price Neutrality." Mr. Carter told his hearers that considerable significance may be attached by manufacturers and business concerns in this country over pacts and secret treaties between other nations.

"What's on the Workers' Mind Today," was the subject of a talk made by Whiting Williams, Cleveland industrialist and industrial counsellor. Mr. Whiting, who has kept abreast of activities in workers' ranks for several years urged the convention members to pay closer heed to their industrial relations problems in the next 10 years. "They are quite likely to be hectic years," said Mr. Whiting.

Harry B. Mathews, vice-president of the Commercial Credit Co., of Baltimore, Md., explained the new plan that has been worked out by finance companies for financing time-payment sales of automotive equipment. This is rapidly becoming one of the most important phases of the automotive industry, and Mr. Mathews said that it was felt the new plan supplied the shortcomings found in the old plan.

What the new Federal and State laws mean to American business was explained by J. W. Van Allen, general counsel for the NSPA. Mr. Van Allen told the convention that the laws which have been passed during the last three years, and those which may be passed the next year, affect every business and that it behooved business men to ascertain their exact positions under the statutes.

The show at Navy pier held two and a half miles of exhibits, with 355 exhibitors occupying every one of the 928 booths. The pier was jammed with jobbers throughout the week. It was estimated that Sunday's attendance, when the show will be open to the general automotive trade, would attract more than 15,000 visitors.

New Highs for Britain

Vehicle Production and Registrations Top Previous Records

In the monthly progress report dated Nov. 21 the Statistical Department of the Society of Motor Manufacturers and Traders shows that the output of the British car, truck and bus industry for the financial year ended Sept. 30, beat all previous records by a big margin. Passenger car manufacturers produced 353,838 complete vehicles and chassis, while the output of commercial vehicles (trucks, buses, coaches, etc.), amounted to 108,109. Thus the total production of all types was 461,947, which represents an increase of 14.4 per cent and which follows an increase of 18 per cent for the corresponding period of 1934-35.

The output of cars for the year to Sept. 30 last is an increase of 13.5 per cent and the monthly totals showed an increase in every month except August. As in previous years the biggest monthly output and sales of cars occurred in March when nearly 40,000 units were produced.

Exports also reached a new high level for the year, 59,700 cars and chassis as compared with 50,219 during the previous 12 months and 15,553 commercial vehicle units against 14,835.

Imports of cars were lower during the year to Aug. 31 (the latest date for which the progress report gives details), a drop of 3519 bringing the total down to 10,173. Imports of commercial vehicles on the other hand showed an increase from 1898 to 2377.

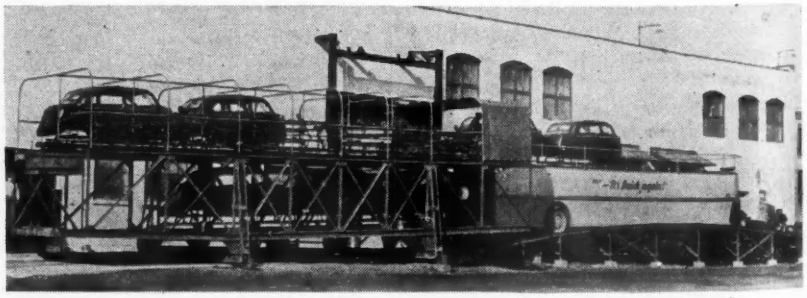
The number of passenger cars in use in Great Britain on Sept. 30 is computed to have been 1,614,578, an increase of well over 150,000. In addition, there were 524,436 commercial vehicles registered.

:SLANTS:

PROPHECY—*Super airliners powered by 16 Diesel engines, spanning oceans at 300 m.p.h. and carrying 200 passengers, were predicted for the very near future by Capt. E. V. Rickenbacker, World War ace and aviation authority, in a paper read before Chicago industrialists and financiers attending a banquet recently in honor of the late Dr. Rudolf Diesel, inventor of the engine bearing his name. Rickenbacker declared the superplane's 16 engines would each have more than 1000 hp., and the ship would be able to cruise many thousands of miles without refueling. It would be even more luxuriously appointed than present-day steamships and trains.*

ANTI-TRAILER—*The Ontario Hotelmen's Association, meeting in Toronto this week, decided to ask the provincial government to impose a special tax on people who live in trailer coaches.*

LOAN KIT—*The British firm of Wolseley Motors has taken a step to insure the peace of mind of its customers traveling abroad with their cars. It is a specially designed kit packed in a steel case containing sufficient square*



The Buick plant has adopted a new machine for transferring automobile bodies from trucks to the receiving room. It takes only 3½ minutes to move seven bodies from a truck—and gravity does the work.

parts to meet most repair needs. It is loaned against a deposit of £7 ($35) which is reimbursed in full if the kit is returned intact. If any parts are used, their price is deducted from the amount paid back.

TRAILERS—*Visits to the toy departments of the large New York stores indicate a prompt awakening to the possibilities of the trailer. Many a model car—the small ones that sell for a dollar or two—has a beautifully streamlined trailer attached. Thus far, the inquiring reporter has noted no model cars of the size that eight-year-olds can get into which have trailers. They will come.*

PICK-UP—*What may be a new mark for automobile stock car acceleration was set recently by a new 1937 Hudson Eight when it went from a standstill to 50 m.p.h. in 9.4 sec. under official supervision of American Automobile Association Contest Board officials. All gears were used and the shifts were made with Hudson's "electric hand." The 1937 Terraplane Six made a similar acceleration test in 10.4 sec., it is reported.*

Autocar Begins Production Of New RL and RM Models

Anticipating a wide market, the Autocar Co., Ardmore, Pa., will begin production on Dec. 15 of the RL and RM models which were introduced at the 1936 Motor Truck Show in Newark. It is estimated that 100 units will be completed before Jan. 1, 1937.

Priced lower than any Autocar chassis has been for 20 years, these new models are listed at $2,460 for the RL and $1,980 for the RM.

The Model RL has a gross vehicle weight rating of 20,000 lb. The Autocar Blue Streak engine with a piston displacement of 358 cu. in. is the power unit. Slightly lighter, the Model RM has a gross vehicle weight rating of 18,500 lb. The Blue Streak engine has a piston displacement of 313 cu. in.

Both models have the Autocar five-speed transmission, double-reduction rear axles and four-wheel vacuum-operated brakes.

Midland Steel Strike Ended

Chrysler and Briggs Resume Operations; Strikers Granted 10% Wage Increase and 45-Hour Week

The seven-day "stay-in" strike of workers at the Midland Steel Products plant in Detroit ended Dec. 4, when agreement was reached on questions involving wages and hours. Some 700 workers evacuated the plant where they had camped for a week when officials of the United Automobile Workers Union advised them that an agreement had been reached with the management.

The settlement provided for wage increases amounting to more than 10 per cent on the average, and the establishment of a 45-hr. week with time and a half for work in excess of 45 hrs. a week. Previously the company paid no overtime rates and the work-week was considered to be 48 hrs. The company agreed to abolish piece-work as soon as practicable and before the next model change in the automobile industry.

According to the management, most of the demands were met before the strike was started and, even before demands had been made the company had voluntarily increased all hourly rates by 5 cents and piece work by 10 per cent. Voluntary increases, effective Nov. 16, established a minimum rate for women of 53½ cents an hour and for men, 61 cents. Prior to Nov. 16, the rates had been 48 cents and 58½ cents, respectively. The management claims that the strikers "sat down" on the Friday following Thanksgiving while negotiations were in progress and at a time when workers were offered "substantially all that they finally got."

Speeches in favor of acceptance were made at the mass meeting by Homer Martin, UAW president; Richard T. Frankensteen, organization director: Wyndham Mortimer, first vice-president, and several shop stewards. Vote for acceptance was almost unanimous. Adolph Germer, representing the John L. Lewis Committee for Industrial Organization, with which the UAW is affiliated, said: "This agreement does not provide all we want, but it does provide a foundation on which to build."

Settlement of the strike returned to work employes of the Chrysler Corp. who had been laid off on Wednesday of last week because of a shortage of frames supplied by Midland. It also returned to work a large proportion of the employes of the Briggs Mfg. Co. which supplies bodies to the Chrysler divisions and was forced to suspend operations in many departments when the Chrysler plants closed. Briggs, Plymouth and Dodge resumed full operations on Monday, and the Chrysler and DeSoto divisions on Tuesday this week. The Lincoln-Zephyr plant lost only one day of work for lack of frames.

New Detroit Strike

Aluminum Workers, Backed by UAW, Demand Wage Increase

About 60 men on the night shift of the Aluminum Co. of America's plant in Detroit went on a sitdown strike Thursday morning, Dec. 10, refusing to leave the plant until the management had met their demands for a wage increase of 20 cents an hour. The employes of this company were unorganized but the United Automobile Workers union is supporting the strike and is setting up a kitchen to feed the men in the plant. According to a union official, the company employs upwards of 300 men in the three shifts. Only the workers in the extrusion department are on strike. Those employed on day shifts returned to their homes after reporting at the plant. The foundry is still working. The men report that the management refused to meet with a representative of the union but asked the strikers to leave the plant while their demands for a wage increase were being considered. The extrusion department makes aluminum window moldings for automobiles.

Briggs-Motor Products Merger

Officials of Body Manufacturer and Automotive Parts Company Agree on Consolidation

Merger negotiations are under way between officials of the Briggs Manufacturing Co. and the Motor Products Co. looking to a merger, according to an announcement made in New York Dec. 10. The merger has been agreed upon in principle, it is understood, and only the details need be worked out, subject to approval by the directors and stockholders of the two corporations.

The Briggs company is the largest independent automobile body manufacturer, supplying Ford, Lincoln Zephyr, Plymouth and Dodge. Motor Products makes a variety of metal parts for automobiles and serves Ford, Chrysler, Hudson, Packard and Studebaker. Both plants occupy adjacent properties in Detroit.

It is assumed that the merger will be accomplished by an exchange of stock although the basis of such an exchange has not been divulged.

Juan de la Cierva

Juan de la Cierva died Nov. 9 in the crash of a Royal Dutch Air Liner which had just taken off in a fog from the Croydon airport near London. Inspired to work for safety in the air by witnessing an air crash in 1920, Cierva invented the autogiro for which he was best known.

He was born in Murcia, Spain, Sept. 21, 1895, graduated from the Special Technical College in 1919 and helped in the building of gliders as early in his life as 1910.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

According to press reports, many branches of manufacturing are expected to reach new high records of activity this year. Several others will approach the 1929 levels and surpass operations in 1930. Most of the record-breaking industries are in the consumer goods lines; but, nevertheless, stocks of these goods have not increased, and the upward trend in prices is gaining momentum.

Retail Sales Hold Gains

There was a considerable decline in business activity last week, but this was largely due to the interruption in operations occasioned by the Thanksgiving Day holiday. Retail sales, however, continued to improve and showed a gain of 10 per cent above those in the preceding week and one of 15 to 30 per cent above those in the corresponding period last year. This increase in retail business was reflected in wholesale trade, which was 25 per cent above that a year ago.

Carloadings Lower for Week

Railway freight loadings during the week ended Nov. 28 totaled 679,984 cars, which marks a decline of 109,516 cars below those in the preceding week, a gain of 108,106 cars above those a year ago, and an increase of 191,799 cars above those two years ago.

Power Output Above Last Year

Production of electricity by the electric light and power industry in the United States during the week ended Nov. 28 was below that during the preceding week but was 13.7 per cent above that in the corresponding period last year.

Crude Production Steady

Average daily crude oil production for the week ended Nov. 28 amounted to 3,010,650 bbl., as against 3,060,950 bbl. for the preceding week and 2,820,450 bbl. for the corresponding period last year.

Strike Hits Lumber Shipments

Production of lumber during the week ended Nov. 21 was 57 per cent of the 1929 weekly average. Production and shipments were both below the level of new orders, a situation largely due to the maritime strike.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended Dec. 5 stood at 86.7, as against 86.0 the week before and 86.1 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Dec. 2 showed no changes in holdings of discounted bills, bills bought in the open market, and government securities. Money in circulation rose $37,000,000, and the monetary gold stock increased $26,000,000.

GM Sales Doubled in November

Sharp Increases Follow Introduction of New Models; Dealer Stocks Shown in Healthy Condition

Following the introduction of new models, General Motors' world sales to dealers jumped to 191,720 in November, compared with 90,764 in October, and 182,754 in November a year ago. Sales for the first 11 months of 1936 totaled 1,798,576 compared with 1,529,990 for the same period of 1935.

Sales of General Motors cars to consumers in the United States totaled 155,552 last November compared with 136,859 in November a year ago. Sales in October were 44,274. U. S. consumer sales for the first 11 months of the current year were 1,546,741 compared with 1,156,798 for the same period last year.

A sharp increase in retail sales during the past month resulted in an increase in dealer stocks of only 489 units, an unusually low figure for a period when dealer stocks are generally rising. Last year's November business resulted in an increase of 10,990 units in dealer stocks.

The accompanying table gives further details of General Motors sales.

	November 1936	October 1936	November 1935	Eleven Months 1936	Eleven Months 1935
Sales to world dealers.....	191,720	90,764	182,754	1,798,576	1,529,990
Sales to U. S. dealers.....	156,041	69,334	147,849	1,485,529	1,220,924
Sales to U. S. consumers....	155,552	44,274	136,859	1,546,741	1,156,798
Change in U. S. dealer stocks	+ 489	+25,060	+ 10,990	— 61,212	+ 64,126
Sales to foreign dealers.....	35,679	21,430	34,905	313,047	309,066

Timken Roller Bearing Co. Makes Personnel Changes

At a meeting of the board of directors of the Timken Roller Bearing Co. on Dec. 5, action was taken on the following changes in officers and directors.

Resignations were accepted from Frederick J. Griffiths as director of the Timken Roller Bearing Co. and president and director of the Timken Steel & Tube Co.; and from K. B. Bowman as general superintendent of the steel and tube mills of the Timken Roller Bearing Co.

William E. Umstattd was elected president of the Timken Steel & Tube Co. which is a wholly-owned subsidiary of the Timken Roller Bearing Co., in addition to continuing in his present capacity as president of the parent company.

H. H. Timken, Jr., previously a vice-president of the Timken Steel & Tube Co., was made executive vice-president of the Timken Steel & Tube Co., in addition to his present capacity as vice-president and director of the Timken Roller Bearing Co.

W. Robert Timken was elected director of the Timken Roller Bearing Co. and of the Timken Steel & Tube Co. to fill the vacancy of the unexpired term.

John E. Fick was appointed general superintendent of the steel and tube mills.

Gas Pump Makers Ask Code

Application has been made to the Federal Trade Commission by the Gasoline Pump Manufacturers' Association to sponsor a trade practice conference for the gasoline pump manufacturing industry. The association, according to the FTC, represents more than 90 per cent of the industry in point of number of companies, sales volume and capital investment.

40 Years Ago

—with the ancestors of AUTOMOTIVE INDUSTRIES

That "Motor Derby"

The Motor Car Club announces a grand tournament to take place next May in the neighborhood of London. One of the features of this tournament, and evidently its chief feature, is to be a "Motor Derby," or a straightaway race for one mile over a level course. The club's chief prize and commendation are to be reserved for the vehicle which first makes a mile in one minute. . . . Has the Motor Car Club quite lost its senses that it should father such folly as this? On all sides people are waiting for practical vehicles. Honest work is needed in shop and study to develop and perfect the different types for everyday use. . . . A "Motor Derby" next May, with carriages striving to make a mile a minute, would be an international calamity. . . . There are two distinct branches of the business now—the motor and the promoter. The intelligent investor and purchaser will have no difficulty in discriminating between them.—From *The Horseless Age*, December, 1896.

Census Shows Vast Motor Gains

Number of Employes Increased 59.2% in Two Years, While Wages Were 116.3% Higher; Only 86 Manufacturers in 1935

Both employment and production in the motor vehicle industries in 1935 showed striking increases over 1933 and 1931, although the high mark set in 1929 has not since been reached, according to preliminary figures compiled from the returns of the Biennial Census of Manufacturers taken this year, released this week by William L. Austin, Director, Bureau of the Census, Department of Commerce.

The combined number of wage earners employed in 1935 in the manufacture of motor vehicles and of motor-vehicle bodies and parts, taken as an average for the year, was 387,725, an increase of 59.2 per cent as compared with 243,614 reported for 1933; and their wages, $545,402,646, exceeded the wage total for 1933 by 116.3 per cent.

The production of complete motor vehicles and chassis for sale as such reached a total of 3,922,746 in 1935. This total was more than double the corresponding one for 1933, and exceeded the 1931 production figure by 70.9 per cent.

For census purposes, an assembling plant (a plant in which parts made in another plant under the same management are assembled into complete motor vehicles) is treated as a manufacturing establishment. This is necessary in order that each state, industrial area, and city may be credited with its due share of the motor vehicle industry. As a result, the number of establishments shown, 121, is much in excess of the actual number of manufacturers. The numbers of such manufacturers reporting for the last three census years (counting the General Motors organization as 6) were as follows: 1935, 86; 1933, 90; 1931, 124.

Comparison of the latest figures with those of previous census years shows a number of important developments. The Automobile Manufacturers Association comments on these as follows:

"The wage earners' proportion of automobile factory dollar increased 33 per cent from 1929 to 1935. Labor's share of the value added by manufacture in automobile, body and parts plants was 48.5 per cent in 1935, while in 1929 labor's share was 36.6 per cent.

"The value added by manufacture figure represents the manufacturers' margin after payment for all materials purchased. Out of this margin, in addition to wages, must be paid all salaries, rents, local, State and Federal taxes, interest and depreciation, advertising and other expenses, as well as dividends to stockholders and additions to necessary reserves.

"The 1935 manufacturers' margin was $1,125,000,000 or 44 per cent less than the $2,002,000,000 of 1929. This decline reflects not only a decline in the volume of vehicles sold of 26 per cent from 1929, but also a reduction in the average factory realization per vehicle of 15 per cent, from $644 to $549, and an increase in the cost of raw materials per dollar of sales.

"Although in 1935 the manufacturers' margin, after payment for raw material purchased, was 44 per cent lower, aggregate wages were only 26 per cent below those of 1929. At the same time, cost of living in automotive centers is estimated 20 per cent below that of 1929.

"The annual individual wage rate in 1935, calculated on the census report, amounted to $1,405. Because of the lower cost of living this figure had a purchasing power equal to $1,750 per year in 1929 wages. The actual average wage rate in 1929 was only $1,640, showing a positive gain in the real income of the individual worker in 1935."

In addition to the biennial statistics, the Bureau of the Census compiles monthly reports on factory sales of motor vehicles. The total of the monthly figures for 1935, 3,946,934, exceeds the corresponding biennial census figure, 3,922,746, by a little more than one-half of one per cent, the difference being due to the fact that the monthly figures represent sales, whereas the biennial census figures refer to production. Moreover, the returns made by some of the manufacturers reporting in the biennial census cover their fiscal or business years, whereas the total of the monthly figures covers the calendar year in all cases.

The report shows further that there were 945 establishments engaged in manufacturing motor vehicles, bodies or parts in 1935, against 823 in 1933, 1118 in 1931 and 1398 in 1929. Wage

(*Turn to page* 828, *please*)

Champion Builds British Plant

Robert A. Stranahan, president of Champion Spark Plug Co., announces the company is building a new $500,000 plant in England at Middlesex, near London, to supply original equipment to several British cars and take care of some British Empire business. The Canadian plant at Windsor, Ont., has recently been operating at capacity.

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—October

	UNITS					ESTIMATED DOLLAR VOLUME*				
				Per Cent of Total					Per Cent of Total	
	1936	1935	Per Cent Change	1936	1935	1936	1935	Per Cent Change	1936	1935
Chevrolet, Ford and Plymouth	104,283	89,698	+ 16.0	61.00	60.69	$62,800,000	$53,700,000	+ 17.0	51.43	50.33
Others under $750	25,888	20,047	+ 29.5	15.14	13.56	18,600,000	14,100,000	+ 32.0	15.23	13.21
$751-$1000	29,408	25,454	+ 15.9	17.20	17.22	24,700,000	21,800,000	+ 13.3	20.23	20.43
$1001-$1500	9,595	10,581	− 9.2	5.61	7.16	11,200,000	12,000,000	− 6.5	9.17	11.25
$1501-$2000	687	785	− 12.4	.40	.53	1,200,000	1,300,000	− 7.6	.98	1.22
$2001-$3000	467	825	− 43.3	.27	.56	1,200,000	2,200,000	− 45.4	.98	2.06
$3001 and over	631	411	+ 53.7	.38	.28	2,400,000	1,600,000	+ 50.0	1.98	1.50
Total	170,959	147,801	+ 15.8	100.00	100.00	$122,100,000	$106,700,000	+ 14.6	100.00	100.00
Miscellaneous	360	588	− 38.6							
Total	171,319	148,389	+ 15.6							

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—Ten Months

	UNITS					ESTIMATED DOLLAR VOLUME*				
				Per Cent of Total					Per Cent of Total	
	1936	1935	Per Cent Change	1936	1935	1936	1935	Per Cent Change	1936	1935
Chevrolet, Ford and Plymouth	1,854,336	1,371,014	+ 18.1	65.07	68.74	$1,118,200,000	$861,800,000	+ 16.0	56.75	60.94
Others under $750	413,631	323,805	+ 27.5	14.51	14.17	297,600,000	230,600,000	+ 29.0	15.11	14.61
$751-$1000	444,438	302,948	+ 46.3	15.60	13.26	370,300,000	256,800,000	+ 44.1	18.79	18.27
$1001-$1500	117,569	70,592	+ 66.2	4.13	3.09	134,700,000	82,700,000	+ 62.7	6.84	5.24
$1501-$2000	8,679	5,491	+ 58.0	.30	.24	15,100,000	9,290,000	+ 62.8	.77	.59
$2001-$3000	6,766	7,770	− 13.0	.24	.34	17,400,000	21,400,000	− 18.7	.88	1.36
$3001 and over	4,368	3,755	+ 16.6	.15	.16	16,900,000	15,600,000	+ 8.2	.86	.99
Total	2,849,787	2,285,375	+ 24.7	100.00	100.00	$1,970,400,000	$1,578,190,000	+ 25.0	100.00	100.00
Miscellaneous	3,915	1,098	+257.0							
Total	2,853,702	2,286,473	+ 24.8							

* All calculations are based on list price F.O.B. factory of the five-passenger, four-door sedan in conjunction with actual new car registrations of each model. The total dollar volume for the different models is then consolidated by price classes.

Joint Council Formed by Unions

United Automobile Workers and Flat Glass Federation Set Up Body for $1,500,000 Action

Two days of conferences this week between executives of the Libbey-Owens-Ford Glass Co. and committees representing Federation of Flat Glass Workers members from four of the company's plants failed to settle the strike at the Ottawa, Ill., plant. Glen W. McCabe, president of the glass workers' union, left Toledo for Pittsburgh where conferences were to be held with officials of the Pittsburgh Plate Glass Co. in an effort to settle the seven weeks' old strike which has closed seven of that company's plants.

Settlement of both strikes became more hopeful when it was reported that the union had virtually abandoned its demands for a closed shop and check-off of union dues.

Formation of a joint council between the Federation of Flat Glass Workers and the United Automobile Workers, two of the 10 Committee for Industrial Organization unions now under suspension by the A. F. of L., was announced in Toledo Dec. 8, by heads of the two bodies. Homer Martin, UAW president, came from Detroit to confer with Glen W. McCabe, president of the Flat Glass Workers, who has been negotiating in Toledo with Libbey-Owens-Ford Glass Co. officials regarding the Ottawa, Ill., plant in which McCabe ordered a strike when it began work on a Chrysler $1,500,000 order last week.

Five general officers of each body will form the joint council. "The council shall have the authority to order such joint action as may be deemed necessary for the purpose of coping with any labor situation that may confront either organization," declared their joint statement. Members of the council representing the automobile workers will be: Homer Martin, president; Wyndham Mortimer, of Cleveland; Edward Hall, of Milwaukee; Walter Wells, of Detroit, and George Addes, of Toledo. Members for the flat glass workers will be: Glen W. McCabe, president; L. T. Jay, of Clarksburg, W. Va.; Henry Baum, of Toledo; Irwin Deshetler, of Columbus, Ohio, and Aubrey Barnette.

Martin gave the flat glass officials glowing reports of organization success in the Detroit region and indicated the union had sought to organize the units outside Detroit first. Protracted conferences here were expected to yield a formula for reopening the Ottawa plant within a few days and McCabe reported that progress is being made toward settlement of the strike in Pittsburgh plate glass plants. No attempt yet has been made at negotiations on a new 1937 working agreement to replace that expiring Dec. 15.

Hupp Refinancing

Plans Call for Capital Reduction and Sale of Unissued Stock

The Hupp Motor Car Corp. has called a special meeting of stockholders on Jan. 7, 1937, at Richmond, Va. At that meeting, there will be submitted a plan for revision of capital which will include cancellation of 193,464 shares of treasury stock and reduction of authorized capital from 2,000,000 shares at $10 a share to 1,000,000 shares of $1 par value, and the exchange by stockholders of their present stock for new stock on the basis of four to one. This will leave outstanding in hands of present stockholders 329,657 shares and will leave authorized but unissued 670,343 shares. Stockholders will be asked to authorize directors to sell this unissued stock, the stockholders having prior right to subscribe to it pro rata based on their present holdings, which will give them the right to take approximately two shares of this new stock for each share of their holdings.

This revision of the capital stock is asked to permit the management to pursue plans for getting new money into the corporation, since it has found that no progress can be made on the basis of the present capital structure.

The 1936 annual meeting has been adjourned to meet also on Jan. 7, 1937.

The management announces that it has redesigned the Hupp cars, providing a complete new line with new body designs conforming fully to the latest trend in car styles, adding many features that bring the product fully up to the standard set for the 1937 market. It expects to be able to market these new cars well within the medium price range.

Car Plants Regain Stride

(Continued from page 805)

February was unavoidable, resulting from impassable highways that checked the movement of cars from the factories, but for the most part it was induced by fear of over-stocking dealers. The sharp rebound in sales following moderation in weather found both dealers and factories unprepared and created a spring production peak that the manufacturers would rather have seen spread over the winter months.

Hoping to avert that situation this year, the companies are planning to maintain production at a high level throughout the winter and only labor troubles are likely to stand in the way of fulfillment of these plans. Despite wage increases, bonuses to workers and reduction in the work-week the labor situation still constitutes a hazard to normal operations and there is little confidence that the industry will be able to carry on without more interruptions.

November shipments of Hudson and Terraplane cars were the largest for any November in the last 11 years, totaling 15,001 cars, an increase of 54 per cent over the total for October and a gain of 15 per cent over November last year. Total shipments of Hudson and Terraplane 1937 models up to Dec. 1 amounted to 24,895 cars, a gain of 29 per cent over the 19,224 cars of the 1936 series shipped up to Dec. 1 last year.

The largest November sales of Studebaker passenger cars and trucks since 1924 were reported by Paul G. Hoffman, president of the Studebaker Corp. Last month's sales amounted to 8944 units against 5383 in November, 1935, and 1869 in November, 1934. Studebaker cars and trucks sold during the first 11 months this year amounted to 84,394 compared with 46,813 in the corresponding period of 1935—a gain of 80 per cent.

Oldsmobile delivered to retail purchasers 5430 new Sixes and Eights during the last 10 days of November. In addition, the company now has on hand the largest bank of advance orders in the 40 years of its history, Mr. Ralston, vice-president and general sales manager, said. Production has been stepped up to more than 1000 cars daily —the highest sustained daily level ever maintained by Oldsmobile. During the month of December, Oldsmobile production schedules call for more than 25,000 cars, as compared with 18,000 during the same period a year ago, an increase of nearly 40 per cent.

Chevrolet dealer's retail sales during the month of November totaled 108,093 units, setting a new all-time record both for the month of November and for the 30-day period following any new model introduction, it has been announced by the company. The previous record of 92,065 units was set in November, 1935, following introduction of the 1936 Chevrolet. This year's November sales were 17.4 per cent greater, although the new 1937 models were brought out five days later in the month, concentrating the heavy selling within a considerably shorter period.

Domestic retail deliveries of Buick motor cars during November totaling 19,284 cars established an all-time high for the month and marked a new peak for 1936, W. F. Hufstader, general sales manager, has announced. The month's deliveries compared with a previous high in November, 1926, when 14,880 Buick cars were delivered to retail customers in the United States. It was the first time in the current phase of Buick's expanding operations that the peak volume of more than 10 years ago was surpassed. The figure compares

with 18,784 cars delivered in April, the previous high month this year, and was a gain of 5965 units or 44.7 per cent over the corresponding month a year ago. Steadily increasing sales resulted in 7259 deliveries during the last 10 days of the month against 6977 in the second 10 days and 5048 during the first 10-day period. It was announced Buick December production schedules had been boosted another 2000 cars. This brings total Buick production for the last quarter of 1936 at 73,094 as against 50,339 in the last 1935 quarter, a gain of 45 per cent. The schedule covers both export and domestic requirements and this year includes production of Buick cars in the General Motors plant in Los Angeles, placed in operation with the advent of the 1937 models.

Outlaws Trailers

Detroit Orders Them Off Parking Lots as Unsanitary

Questions involved in the use of trailers for residences are certain to become the subject of early legislation in Michigan as the result of steps taken by city authorities in Detroit to oust trailerites from a down-town parking lot.

The Detroit Board of Health served notice last week on 19 trailer residents who live on a parking lot at Clifford and Henry Streets to vacate on the grounds that the trailer houses were unsanitary and unhealthful. According to police department records, more than 100 trailers are being used for permanent residences in Detroit.

The city has no ordinance covering trailers and city officials are inclined to favor a uniform State law. The framing of a bill for submission to the State legislature calling for regulation of trailer lots was promised by Nathaniel Goldstick, assistant corporation counsel. He also promised that no drastic action would be taken against the trailer occupants who have been asked to move unless a court ordered them ousted after a proper hearing. Edward Robbins, proprietor of the trailer colony lot, said: "We will get a lawyer and appeal to the highest court if necessary."

Meanwhile trailer manufacturers have entered the fight, holding conferences with municipal and State authorities in which the complexities of the situation involving trailer residences were discussed. Both State and local officials assured the manufacturers that there was no government hostility toward the trailer industry and that the question was solely one of making suitable arrangements for the inhabitants of the trailer colonies.

Municipally operated parking lots for trailer coaches were offered as the solution to the problem at the meeting of the Trailer Coach Manufacturers Association with State and local authorities.

AMA Output Up 55%

New Record Set for November Factory Shipments

More motor vehicles were shipped from the factories of Automobile Manufacturers Association members during last month than in any previous November in the history of the industry, the preliminary report released this week by the association disclosed.

Factory shipments for the month amounted to 337,446 cars and trucks, the association reported. This was a 55 per cent increase over the preceding month and a 12 per cent increase over November of last year. In addition, it represented a gain of 235 per cent over the five-year November average.

On the basis of this estimate, factory shipments for the year to date were placed at 3,119,865 units—a 23 per cent increase over the same period last year and an 86 per cent increase over the five-year (1931-1935) average for the period.

The report, which covers the operations of all but one of the major automobile producers in the United States, is summarized below:

November, 1936	337,446
October, 1936	217,340
November, 1935	300,388
5-year November average	100,731
11 months, 1936	3,119,865
11 months, 1935	2,537,897
5-year average for 11 months	1,681,540

WALTER G. RETZLAFF has been named sales manager of the Fruehaf Trailer Co.'s wholesale division with headquarters at the Detroit plant. Mr. Retzlaff has had a long experience in the trailer industry, much of it with the Fruehauf company.

KEN M. SCHAEFER has been appointed vice-president and general sales manager of Silver Dome, Inc., Detroit. Mr. Schaefer formerly served the General Motors' Pontiac division as district manager and until recently headed trailer sales for the Aladdin Co.

W. J. BEATTY, formerly foreign sales manager, has been appointed manager of the sales department of the J. G. Brill Co., reporting to Charles O. Guernsey, vice-president. In his new position, Mr. Beatty will be in full charge of the headquarters sales staff at Philadelphia in addition to his former duties.

FRED E. DAYES has been appointed vice-president in charge of parlor coach sales for the J. G. Brill Co., reporting to Charles O. Guernsey, vice-president. Mr. Dayes will be in charge of a.c.f. coach sales in the intercity bus field, and will make his headquarters at Philadelphia.

ROBERT A. OLEN, son of Walter A. Olen, president of the Four Wheel Drive Auto Co., Clintonville, Wis., has been appointed manager of direct mail and motion picture development in the FWD advertising department. Olen has been with the company 10 years, recently as a salesman in the New York branch territory.

A. H. RICE, since last June editor of *Truck News,* house organ of the Four Wheel Drive Auto Co., and later manager of publicity, has again been promoted and is now assistant manager of advertising for FWD.

Retail Financing Gains 35% in Year

Car Buyers' Paper Totaled $106,501,399 in October; Wholesale Financing Amounted to $75,207,952

The dollar volume of retail financing for October, 1936, for the 456 identical organizations reporting to the Department of Commerce, amounted to $106,501,399, a decrease of 16.9 per cent when compared with the preceding month, according to the figures released by the Bureau of the Census. Compared with October, 1935, the retail dollar volume, however, showed a gain of 35 per cent.

The $75,207,952 shown for wholesale financing for October this year is an increase of 30.6 per cent over September, 1936, and of a decrease of 4.3 per cent from October, 1935.

The accompanying table gives further details from the Census report.

Year and Month	Wholesale Financing Volume in Dollars	RETAIL FINANCING											
		TOTAL			NEW CARS			USED CARS			UNCLASSIFIED		
		Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car
October, 1936	$75,207,952	275,747	$106,501,399	386	100,086	$60,791,600	$607	173,766	$45,080,272	$259	1,895	$629,527	$332
September, 1936	57,578,092	324,435	128,150,101	395	134,052	79,109,712	590	188,045	48,212,845	256	2,338	827,544	354
October, 1935	76,577,367	221,655	78,903,776	356	76,411	44,024,207	576	142,827	33,992,779	238	2,417	886,790	367
10 Months, 1936	1,384,450,196	3,644,371	1,454,133,353	399	1,610,381	932,781,751	579	2,011,023	513,254,399	255	22,967	8,097,203	353
10 Months, 1935	1,112,021,466	2,621,338	960,111,912	366	1,077,880	592,409,419	550	1,503,357	353,223,258	235	40,101	14,479,235	361

Automotive Metal Markets

Steel Rate Hits Highest Mark in Six Years, Breaking All November Records; Old Prices Rule for January

By William Crawford Hirsch

Although according to one report in the steel market some business in sheet for first quarter shipment has been booked at the recently announced price advance by a producer, who declared himself unwilling to add to his backlog at old prices, there has so far been no representative buying on the higher price basis.

Announcement was made by one of the leading interest's subsidiaries that: "on commodities that require finishing operations beyond the actual rolling it will be impossible to set a definite completing date, but on such commodities shipment must be completed by Jan. 31 at the latest," and that tonnage which cannot be completed by Jan. 31 will be billed after Feb. 1 at the higher prices. It virtually makes it possible for finishing mills to book this month orders to the full extent of their productive capacity up to the end of January.

With the advance in prices of semi-finished steel, however, becoming fully effective on Jan. 1, non-integrated sheet-rollers may be expected to play close to the cushion of their old-price reserve in whatever business may be offered to them between now and the end of the year. What the price advance in cold-rolled strip will be is not yet definitely known, some producers having announced a $5 per net ton increase while others have marked their price up $4. Bolt and nut prices have been revised in keeping with the advance in the basic material.

The current rate of steel mill operations—76.6 per cent of capacity for this week—is the highest in six years and last month's ingot output of 4,337,412 gross tons, according to the American Iron and Steel Institute, broke all records for any November in the industry's history. Except for a rearrangement of production schedules made necessary by labor troubles, close-to-capacity operations over the remainder of this month and in January are assured by mill backlogs. A mild slowing down of pressure during the second half of the first quarter is generally looked for.

Pig Iron—Production continues at not very far from a 100,000 tons per day rate and the bulk of it is for current and nearby melts. Neither buyers or sellers are disposed to favor long-range coverage. Automotive foundries, for the most part, are issuing shipping orders against previously closed contracts, as the iron is needed. The price of Holland iron at the Atlantic Seaboard has been advanced $1 a ton.

Aluminum—The market for both primary and secondary aluminum is on an even keel. The firm tone of the Middle West scrap market imparts, however, a stronger tendency to that for secondary metal and alloys.

Copper—With some of the Connecticut fabricating plants running three shifts, domestic consumption of copper is sensed to be heavy, but current transactions in the market for the metal show little of this, takings so far this month having been negligible. The price of electrolytic copper remains unchanged at 10½ cents.

Tin—What the King's private affairs have to do with the tin market is difficult for Americans to fathom, but there is no question that King Edward's troubles acted depressingly on London Metal Exchange values this week and, in consequence, the price of tin was held in check, spot Straits tin being quoted here at the beginning of the week at 50¾ cents.

Lead—Active and firm.

Zinc—Quiet and unchanged.

Sloan Answers FTC

"6% Plan" Never Intended to Deceive Purchasers, He Says

In reply to the complaint issued Dec. 3 by the Federal Trade Commission charging that the General Motors Corp. and its subsidiaries, including the General Motors Acceptance Corp., as well as other automobile and finance companies, were violating Sec. 5 of the Federal Trade Commission Act by making false and misleading representations in their advertising of deferred payment plans, Alfred P. Sloan, Jr., president of General Motors, issued a statement which reads in part as follows:

"My attention has been called to a recent complaint of the Federal Trade Commission, in regard to the policy of the automotive industry in the financing of new cars sold on the time payment principle. To my mind, this is a very interesting and instructive situation. Therefore, it seems to me to be highly desirable that the public get a proper understanding of the facts and circumstances.

"In the first place, everybody knows that the automotive industry has followed consistently and aggressively—and, I believe, with reasonable intelligence—the sound principle of striving to always produce better merchandise, at an always relatively lower price. That fact is so unanimously recognized that it needs no support from me. In view of the fact that a relatively large proportion of new motor cars are sold on some time payment plan, naturally the cost of financing is just as essential a part of what the consumer pays as the value of the motor car itself.

"General Motors Corp. for a long time past has been gravely concerned with what is going on in the financing field. It has spent large sums in advertisements, and in other ways, trying to educate the consumers as to the realization of what they were paying for financing their new car purchases, but with very little result. The difficulty was, that the average purchaser, having determined the car he wants, and having made the deal on the usual used car taken in exchange, was in no frame of mind to contemplate, or understand, the intricacies of deducting from the amount he owes the amount to be paid down, and the amount to be paid from month to month, with due allowance for an equitable finance charge. And this complication has lead to practices which, so far as General Motors Corp. is concerned, it certainly can not support.

(*Turn to page* 831, *please*)

A catalog-type broadside, entitled **"Power Plant Measuring Instruments, Telemeters and Automatic Controls,"** has just been announced by the Leeds & Northrup Co., Philadelphia.*

Bulletin numbered BF-1, which is entitled **"The Making and Shaping of Alloy Construction Steels,"** has just been issued by the International Nickel Co., Inc., New York.*

"Nitri-Cast-Iron" is the title of a descriptive brochure recently made available by the Forging and Casting Corp., Ferndale, Mich.*

*Obtainable from Editorial Department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Streets, Philadelphia, Pa.

Calendar of Coming Events

SHOWS

National Motor Boat Show, New York, Jan. 8-16

Illinois Automotive Ass'n, 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago.....Apr. 24-28, 1937

CONVENTIONS AND MEETINGS

Tin Can Tourists' Homecoming, Arcadia, Fla. ....Dec. 28, 1936-Jan. 3, 1937

S.A.E. Annual Meeting, Detroit, Mich., Jan. 11-15, 1937

American Road Builders Association, Highway Exhibit and Convention, New Orleans .....Jan. 11-15

Tin Can Tourists' Winter Convention, Clearwater, Fla. ....Jan. 29-Feb. 8, 1937

Tin Can Tourists' Winter Convention, Sarasota, Fla. .....Feb. 8-14, 1937

International Association for Testing Materials, Second International Congress, London, England, April 19-24, 1937

American Society for Testing Materials, 937 Regional Meeting and Committee Week, Palmer House, Chicago, March 1-5

41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee, beginning May 2, 1937

American Petroleum Institute, Mid-Year Meeting, Colorado Springs, Col. .....June 1-3

Second World Petroleum Congress, Paris, France .....June 14-19

CONTESTS

Los Angeles Raceway, 500-Mile International Sweepstakes .....March 28

Indianapolis Speedway, 500-Mile International Sweepstakes .....May 31

Pan American Cup Race, Roosevelt Raceway .....July 5

Roosevelt Raceway, 400-Mile George Vanderbilt Cup Sweepstakes....Sept. 6

Los Angeles, 2nd 500-Mile International Sweepstakes .....Nov. 28

Just Among Ourselves

Some Observations on the Pogue Carburetor

During the past several months members of the Automotive Industries Staff have been asked by scores of people in all branches of the industry: "What do you think about that new carburetor up in Canada." We try always to base our thinking on facts. There are no facts available on the Pogue carburetor—we've tried to get them. So here is our opinion, based on a careful check of the claims for the device, as published in divers places.

CONSIDERABLE publicity has been given in the Canadian press recently to what is described as a new carburetor by means of which the inventor claims to have obtained a fuel mileage of 216 per gal. (the Imperial gallon, no doubt) with a well-known low-priced car. It is stated that on the announcement of these results the stocks of oil companies took a tumble on the Toronto Exchange; that men of great wealth or powerful political connections are financing the development, and that the inventor's laboratory has been broken into on two separate occasions, when working models were stolen. It is added that the models stolen were incomplete.

With regard to the claims made for this carburetor it may be said that if the inventor could substantiate them, the consequences would certainly be most important. But before they are substantiated by some recognized authority we need not get unduly excited. Carburetors and other attachments for which remarkable results were claimed have been announced time without number, although not so frequently in recent years, as the public has become much more sophisticated in such matters.

During the early twenties so many fuel-saving devices were placed on the market here, and the public demand for authentic information regarding their efficiency became so insistent, that the National Bureau of Standards in Washington saw fit to offer a special service to the inventors or promoters of these devices. For a fee of $35 it would test the devices and tell the sponsors whether their claims could be substantiated. The writer was told in this connection that this comparatively low charge was made possible by the fact that the sponsors of these fuel savers were not "pikers"; that instead of claiming gains of a few per cent, which would have required comparatively accurate tests to prove or disprove, 25 per cent was usually the minimum, and it was easy to check such extravagant claims.

Claim 700 per cent Gain

COMPARED with the Canadian inventor above referred to, these earlier promoters of fuel economizers certainly must be classed as "pikers," for if we consider that 25 miles per Imperial gallon is good average performance for a low-priced American car, then his claim is of a gain of 700 per cent in one fell swoop.

In judging this claim we have to consider a number of well-established facts. There is a certain maximum-economy mixture of gasoline and air, consisting of approximately 16 parts by weight of air to one part of gasoline. If it delivers such a mixture, with all of the gasoline vaporized and thoroughly mixed with the air, that is the very best any carburetor can do. Now it is not at all difficult to quite closely approach this ideal condition with a single-cylinder engine operating under constant load and at constant speed, or with a multi-cylinder engine having a separate carburetor or a separate fuel jet and mixing tube for each cylinder, and from the performance of such engines we know pretty well what can be expected in the way of fuel economy under these ideal carburetor conditions. The fuel consumption, of course, will be less than in a conventional installation.

There is a Limit

IN the latter the carburetor cannot be adjusted to deliver the maximum-economy mixture, because with the unequal distribution some of the cylinders might receive a mixture so poor that it would not fire at all. Then, it is generally considered advisable to adjust the carburetor to give a materially richer (and less economical) mixture because that gives slightly more power and improves the pick-up. But the possible improvement from supplying the engine with a perfect mixture, while appreciable, is by no means such as to result in a reduction of the consumption in the proportion of 8:1.

A few figures on power requirements and fuel consumption may throw some further light on the subject. An Imperial gallon of average gasoline has a heat content of about 140,000 B.t.u., and this is equal to

(*Turn to page 828, please*)

How Much A

By Thomas G. MacGowan*

AUTOMOBILE consumers are fairly accurate in indicating whether a few of the better-known cars have or do not have non-exclusive automobile mechanical features, and with regard to the other cars they just don't know.

A couple of these features, independent front wheel suspension and "V"-type engines, stand out above the rest in point of consumer identification with makes of cars. Hydraulic brakes do quite well in consumer recognition, while all-steel bodies and one-piece steel roofs—two of the biggest guns in the motor industry's advertising artillery—do very poorly.

In general, men are better than women at feature identification.

The consuming public isn't particularly good at absorbing the fact that a new car has been introduced. At this sort of thing men also excel. However, when the matter advertised has a feminine slant, the women know about it much more often than do the men.

These conclusions develop from two branches of our investigation of automobile consumers' knowledge of the facts and claims which the passenger car industry attempts to impress upon them. They dovetail nicely with our findings upon consumer slogan-consciousness, which, reported in the first article of this series, indicated that the expenditure of much automotive money does not necessarily create the hoped-for impression on the automobile buyer, and that only a few slogans have registered well with the public.

In this survey, conducted by personal interviewers and including the responses of 639 persons to a long questionnaire, we investigated consumer consciousness of two types of automobile features; those which are non-exclusive and are found upon a fairly large proportion of all cars, and those which, known by a trade name or special distinguishing term, are used by only one or two makes. The former class provided the basis for the feature questions reported upon in this article.

The first concerned steel bodies, as heavily advertised in recent years as any mechanical feature of passenger automobiles. It was phrased as follows: "What cars do *not* have all-steel bodies?"

The question was put in the negative because this year there were fewer cars without all-steel bodies than with them, and because we wanted to learn specifically whether the absence of the feature from these cars had impressed itself upon consumers, either through the absence of positive claims to its

HOW effective is automobile advertising in spreading awareness of a particular make of passenger car and its heralded features? To what degree has the bombardment of messages from billboards, the radio and the printed page registered in the minds of Mr. and Mrs. Average Consumer?

Answers to these questions are being presented in a series of four articles written for AUTOMOTIVE INDUSTRIES by Thomas G. MacGowan, president of a prominent statistical organization in the marketing and advertising field, who backs up his statements with facts obtained from a statistical-sampling method of proved reliability.

Parts 1 and 2 of the series appeared in the Nov. 7 and Nov. 28 issues of AUTOMOTIVE INDUSTRIES.

In this, the third article of the series, Mr. MacGowan supplies revealing figures on how accurately the consumer associates automobile construction features with the particular passenger cars which have them.

The final article, which will appear in a subsequent issue, will contain the most important conclusions that can be drawn from this investigation of the automobile consumer's advertising consciousness.

Reader comment on this article or on the whole series is cordially invited.—THE EDITOR.

* President, *Facts, Incorporated.*

Automobile Advertising Sticks ?

Part 3

Although many widely advertised automobile mechanical features are non-exclusive, the average consumer associates them accurately with only the better-known cars.

possession or through personal experience.

The results of the questioning do not speak very well for the consumer's consciousness of the steel body situation. First of all, we find that nearly half of the 639 responders, or 304 (47.57 per cent), would not even attempt to answer the question. Of the remaining 335 not one could name all the ten makes whose outputs, either wholly or in part, do not have all-steel bodies. Those who answered the question were responsible for a total of 799 actual mentions, including 148 mentions of General Motors, eight for Chrysler, and seven for Hudson Motors. If these be assigned to each car of the companies in question, the total number of mentions is 1570 and the score as to accuracy is as follows:

	No.	Per Cent
Correct mentions	1164	74.14
Partly correct mentions	17	1.08
Incorrect mentions	389	24.78
	1570	

Men took the palm for trying to answer this one, for 55.56 per cent of them made an attempt, while only 38.46 per cent of the women did. However, when we examine the results of these efforts, we find a far different story. Men were right 73.25 per cent of the time, while women's responses were 80.87 per cent correct. The younger people were much the best both at trying to name the cars without all-steel bodies and in actually doing so.

It was, of course, extremely interesting to discover how many of the responders would name the General Motors cars. This line, with six of the ten makes which, in 1936 lacked all-steel bodies, has this year substantially increased its proportionate share of the passenger car market in spite of its continued adherence, in the face of the all-steel-bodies-for-safety trend, to the steel-and-wood construction.

Chevrolet led the parade on this type of recognition with 227 identifications by the 639 persons interviewed. Here is the result in detail for all the 1936 cars which did not have bodies made entirely of steel:

	No.	Per Cent
Chevrolet	227	35.52
Buick	180	28.17
Pontiac	177	27.70
Oldsmobile	176	27.54
Cadil'ac	174	27.23
LaSalle	166	25.98
Packard	32	5.01
Graham	20	3.13
Pierce-Arrow	12	1.88
Lincoln V-12	0	....

The General Motors cars, in other words, have had a good measure of recognition on the body material question, while others, among which Packard is notable, have not.

Mentions of Lincoln were counted as "partially correct," since the Lincoln-Zephyr did have an all-steel body. The Lincoln was mentioned without qualification by 17 persons, 2.66 per cent of the total.

One of the surprises of the survey came in the extraordinarily high number of persons who erroneously thought that the Ford car lacked an all-steel body, possibly through confusing this matter with its lack of a steel roof. Ford was mentioned by 127 persons, or 19.87 per cent of those questioned; a large proportion to be ignorant of the car's possession of so important and widely advertised a feature.

Here is the rest of the list of cars which *did* have all-steel bodies this year with the percentages of all the interviewees who incorrectly names them: Plymouth, 5.01; Terraplane, 4.07; Nash, 4.07; Dodge, 3.44; Chrysler, 3.29; Willys, 2.82; Reo, 2.82; Hudson, 2.66; DeSoto, 2.35; Auburn, 2.19; Studebaker, 2.03; LaFayette, 1.72; Hupmobile, 1.72, and Cord, 1.56.

Equally revealing were the responses to the question on steel roofs: "What cars do *not* have one-piece steel roofs?"

Here there was a larger number of cars, 13, to be named. A total of 301 persons, or 47.11 per cent, were unable to give a response. This is almost the same number of interviewees that balked at the question on all-steel bodies. The percentage of all mentions which were correct was, however, considerably lower:

	No.	Per Cent
Correct mentions	710	60.58
Partly correct mentions	72	6.14
Incorrect mentions	390	33.28
	1172	

Men responded more often than women. Their percentage of response was 55.36; that of women was 41.88. They were also more often right in their answers, for women's superiority in the

matter of accuracy ended with the steel body question. Men were right 61.52 per cent of the time; women's answers were 51.38 per cent right. The age trend shown on the steel body responses was reversed here, the older responders proving the most accurate.

Only three of the cars that had no one-piece steel tops received any considerable number of mentions, namely, Ford, Plymouth and Chrysler. The others were mentioned but little more often than were most of the cars which did have roofs of this type. Here are the cars that didn't have one-piece steel tops, and the tabulation of the interviewees who named them:

	No.	Per Cent
Ford	237	37.09
Plymouth	133	20.81
Chrysler	72	11.27
Dodge	60	9.39
DeSoto	51	7.98
Packard	41	6.42
Willys	28	4.38
Auburn	27	4.23
Hupmobile	26	4.07
Reo	21	3.29
Pierce-Arrow	14	2.19
Nash { Ambassador	0	....
Nash { Super "8"	0	....

Mentions of Lincoln and Nash which did not specify models had to be tabulated as "partially correct," since the Lincoln-Zephyr and the Nash "400" did have one-piece steel roofs. There were 39 Lincoln mentions (a 6.10 per cent response) and 33 mentions of Nash (5.16 per cent).

No car had more than a comparatively small number of erroneous mentions. Chevrolet had 7.04 per cent; Pontiac, 6.57; Buick, 6.10; Cadillac, 5.95; Terraplane, 5.79; Oldsmobile, 5.48; LaSalle, 5.32; Hudson, 4.54; Studebaker, 3.76; Graham, 3.60; LaFayette, 3.29; Lincoln-Zephyr, 2.03, and Cord, 1.56.

Only six makes of cars in 1936 lacked hydraulic brakes. We tested the responders' ability to name them with the following question. "What cars do *not* have hydraulic brakes?"

A larger number of interviewees tackled this question than attempted answers to the questions on bodies and roofs: 433, or 67.76 per cent. Men, with a percentage of response of 70.31, were far more inclined to answer than were women who had a percentage of 56.41.

The general percentage of correctness, however, slumped badly here:

	No.	Per Cent
Correct mentions	500	57.67
Partly correct mentions	49	5.65
Incorrect mentions	318	36.68
	867	

Men again led the percentage of accuracy, which was 57.83, as compared with that of 56.67 for women. The age breakdown here shows the oldest responders leading, followed closely by the youngest, with the middle groups striking a median point in accuracy.

Ford's mentions were outstanding among the cars which were correctly named as lacking hydraulic brakes. This is interesting, in view of Chevrolet's regaining of supremacy in the lower priced field and the gains of the other low-priced cars, all of which, except Willys, have hydraulic braking. The findings show that 62.28 per cent of the persons interviewed, or 398, knew that the Ford did not have hydraulic brakes. Correct mentions, with their percentages of the total number of persons interviewed, are as follows:

	No.	Per Cent
Ford	398	62.28
Lincoln	60	9.39
Willys	30	4.69
Pierce-Arrow	12	1.88
Packard "8"	0	...
Super "8"	0	...
Cadillac "12"	0	...
"16"	0	...

Because the Packard "120" did have hydraulic brakes, mentions that simply specified Parkard were listed as "partially correct." The same course was followed with mentions of Cadillac, as the Cadillac "8" and "12" had hydraulic braking. There were 31 Packard mentions (4.85 per cent) and 18 for Cadillac (2.82 per cent).

There were only a few incorrect mentions, led by Nash, with 25 (3.91 per cent of the total number of responders), and Terraplane, with 18 (2.82 per cent).

This was the question on independent front wheel suspension: "What cars have independently sprung or 'knee action' front wheels?"

A total of 518 persons (81.06 per cent of the entire number interviewed) attempted to answer this question, and their responses were 91.09 per cent correct, 1.34 per cent partially correct and only 7.57 per cent incorrect.

Of all the men in the survey, 83.52 per cent answered, while only 70.09 per cent of the women replied. Men had an average correctness of 91.18, women a correctness percentage of 90.39.

The only cars getting a good response were those made by General Motors. Chevrolet led off with 452 correct mentions, easily outdistancing Buick with 313. As in the cases of the earlier questions, some of the cars were almost without recognition:

	No.	Per Cent
Chevrolet	452	70.74
Buick	313	48.98
Pontiac	297	46.48
Oldsmobile	284	44.44
LaSalle	233	36.46
Cadillac	231	36.15
Chrysler	61	9.55
DeSoto	56	8.76
Studebaker	30	4.69
Nash	9	1.41
Cord	5	.78
Packard "120"	0	...

Mentions of Packard totaling 29 (1.34 per cent) were classified as "partially correct."

Among the incorrect mentions Plymouth led with 60 (9.39 per cent), followed by Dodge with 28 (4.38 per cent) and Ford with 23 (3.60 per cent). The other cars named each received very few mentions.

Here is the last of the questions on non-exclusive features: "What automobiles have 'V'-type engines?"

This question brought out the largest response; 609 of the 639 persons interviewed, or 95.30 per cent, answered it, and the answers they submitted were 84.02 per cent right, 3.96 per cent partly right and 12.02 per cent wrong.

Men once more responded more frequently than women, and again they enjoyed a narrow lead in the correctness of their responses.

Ford, as might have been expected, in view of its frequent use of "V-8" as an integral part of the name as advertised, had by far the greatest amount of recognition here; 598 responders (93.58 per cent) identified it as having a "V"-type engine. Cadillac and Lincoln did well; the Packard "12" and the Pierce-Arrow "1602" and "1603" did poorly:

	No.	Per Cent
Ford	598	93.58
Cadillac	387	60.56
Lincoln V-12	252	39.44
Zephyr	74	11.58
Packard "12"	3	.47
Pierce-Arrow "1602"	0	...
"1603"	0	...

There were, however, 49 mentions of Packard (7.67 per cent) and 13 of Pierce-Arrow (2.03 per cent), which, because not all of these cars had "V"-type engines, are classified as only partly right.

Responses to Questions on Non-Exclusive Mechanical Features

	Percentages of Correct Mentions to All Mentions			Percentages of Responders Answering the Questions		
	Total	Men	Women	Total	Men	Women
What cars do *not* have all-steel bodies?	74.14	73.25	80.87	52.43	55.56	38.46
What cars do *not* have one piece steel roofs?	60.58	61.52	51.38	52.89	55.36	41.88
What cars do *not* have hydraulic brakes?	57.67	57.83	56.67	67.76	70.31	56.41
What cars have independently sprung or "knee action" front wheels?	91.09	91.18	90.39	81.06	83.52	70.09
What automobiles have "V"-type engines?	84.02	84.18	83.13	95.30	95.79	93.16
All Questions	77.13	77.08	77.49	69.89	72.11	60.00

The only outstanding result of the tabulation of the wrong mentions is the appearance of 124 for LaSalle (19.41 per cent). The other cars mentioned each had a minute response.

Perhaps the most impressive single finding of this phase of our study is the strikingly low degree of recognition accorded the possession or non-possession of the features in question by most of the makes of automobiles. Only a few cars have registered their non-exclusive points reasonably well.

So much for the questions on consumer recognition of non-exclusive features. Now for the results of our effort to measure impressions on a new car introduction, an old car reintroduction and on an advertising appeal with a feminine slant.

What impression is made on the public mind by the reintroduction, after a lapse of several years, of a car whose name was formerly fairly well-known? Of course, no one query could supply the answer to so general a question as this, but we did investigate it in terms of the reaction to the new Cord. The question: "What car was reintroduced last fall after being off the market for several years?"

In this case we had a car of exceptionally striking appearance with a number of unique features, any or all of which might have served to offset in some measure the lack of a large advertising appropriation and to register the Cord name on more consumer minds than would otherwise have been the case.

The findings indicate that this probably occurred, for 171 men and women, 26.76 per cent of all those questioned, gave the correct response; a greater number surely, than could have seen, noted and remembered the limited Cord advertising. True, an even greater number, 179, or 28.01 per cent, gave wrong responses, and 289, or 45.23 per cent, gave no responses at all. But the fact remains that more than one person out of four knows that the Cord has reappeared.

If it had not been for our male responders, however, there would have been a far less impressive story, for 28.54 per cent of them answered correctly, whereas only 18.8 per cent of the women did so. When men answered they were right 50.34 per cent of the time; women's answers were 40.74 per cent right. Men's percentage of failure to respond was 43.30; women's, 53.85.

It is interesting to observe the cars that appear on the list of wrong mentions: Willys leading with 61 was mentioned by 9.55 per cent of the responders. The others included: LaFayette, 37; Graham, 12; Reo, 8; Hupmobile, 7; Lincoln-Zephyr, 5; Nash, 5; Studebaker, 4; Pierce-Arrow, 4; Auburn, 4; Dodge, 3; LaSalle, 3; DeSoto, 3; Hudson, 3; Oldsmobile, 2, and Terraplane, 2; and there were single mentions of other makes.

The younger responders were without exception better at identifying the Cord as the car in question than the older ones.

How hard is it for the manufacturer of an entirely *new* automobile to make the car-buying public aware of the existence of his product? After a year of heavy advertising of a new car of popular make how many people know the car has appeared? We had an ideal situation for the investigation of these questions in the late 1935 introduction and the subsequent large-scale publicizing of the Lincoln-Zephyr. Here was the question: "What entirely new automobile was introduced last fall?"

It might seem at first glance that a very large proportion of our responders would be able to name the Zephyr in answer to this query, but this did not prove to be the case. Only 249 persons, or 38.97 per cent, gave this answer, while 95, or 14.87 per cent named other cars (which were, of course, not new) and 295, or 46.16 per cent, were frankly unable to vouchsafe a response.

It is natural to wonder why fewer than four out of ten persons in the automobile market know that the Lincoln-Zephyr is the one new car launched late last year, even though the point lies outside of the province of this survey. However, it is, of course, safe to say that had the car been one of the largest sellers it would have advertised itself on the street to a greater extent and left its impression on more of our interviewees.

The fact that it was not a large seller makes the situation all the better as one in which to measure the one-year success of a new-car promotional program.

Men excelled with this question, having a percentage of correctness amounting to 39.27 as against one of 37.61 for women. They also responded more frequently. Their percentage of failure to respond was 45.02; women's was 51.28. The women, however, when they responded, were right 77.19 per cent of the time, as against 71.43 per cent for the men. The younger the responder, the more likely was he to know the right answer; 42.86 per cent of the "20 to 29" age group responded correctly, while in the "50 or over" group the percentage was 22.22.

The people who gave wrong answers leaned heavily on LaFayette, which they mentioned 43 times; 6.73 per cent of our automotive test-tube reactors thought this two-year-old-car was half its real age. Other mentions were: Terraplane, 6; Packard, 9; Cord, 4; Nash, 3; Willys, 2; and one mention each for Cadillac, DeSoto, LaSalle and Lincoln.

Now for the question in which we endeavored to find out whether women automobile consumers are more cognizant of feminine advertising angles than are the men: "What new car was styled by a woman designer?"

Here was no such issue as confronted the responders in the preceding questions. Helen Dryden's job of styling the 1936 Studebakers was heavily advertised during the year and mentioned in most Studebaker copy, but it was not given top featuring.

Nevertheless, 128 responders, or 20.03 per cent of those questioned, knew the answer to this query, and only 57, or 8.92 per cent, were wrong. There were a large number of failures to respond: 454, or 71.05 per cent.

Most interesting is the fact that while only 19.73 per cent of the men could identify Studebaker with this question, 21.37 per cent of the women could. And the women's percentage of failure to respond was only 66.67, as contrasted with that of 72.03 for the men.

The men who tried to answer had a higher percentage of correctness, 70.55, than the women, whose percentage was 64.10.

The results for the age groups show a variation from the normal trend here, for the percentage of correctness in response falls with increasing age until the highest age group, that of "50 or over" is reached, and for this group rockets to 22.22, just below the 23.08 figure set by the group aged from 20 to 29.

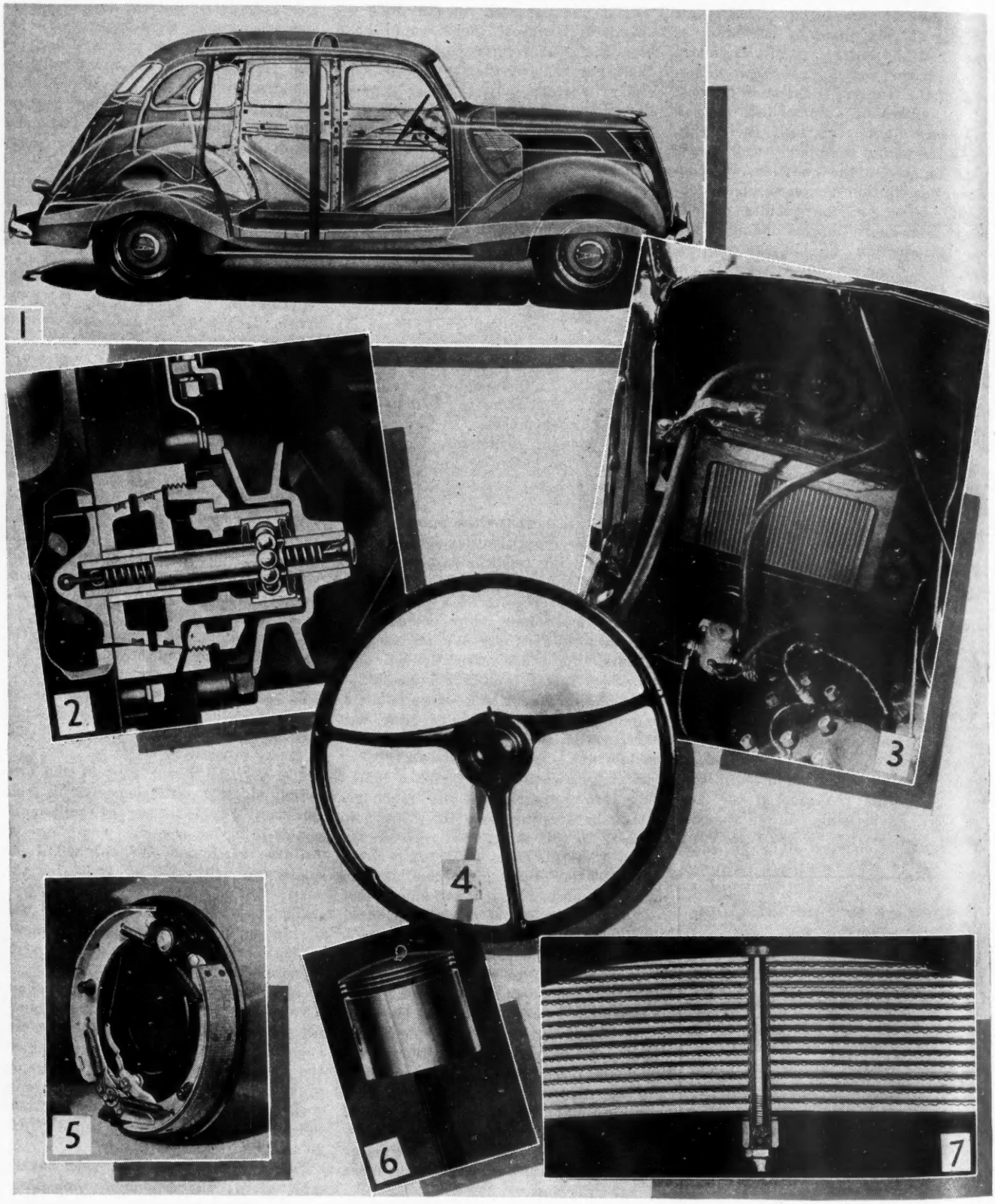
Dodge was mentioned incorrectly most often; 12 responders thought a woman had designed it. Others mentioned included: Lincoln-Zephyr, 7; Nash, 6; Terraplane, 4; Chrysler, 4; DeSoto, 3; LaFayette, 3; Cord, 3; Buick, 2; Chevrolet, 2; Pontiac, 2; Pierce-Arrow, 2, and Hudson, 2.

Responses to Special Questions on 1936 Innovations

	Correct Responses Per Cent*	Incorrect Responses Per Cent*	No Response Per Cent*
What car was reintroduced last fall? (Cord)			
Total	26.76	28.01	45.23
Men	28.54	28.16	43.30
Women	18.80	27.35	53.85
What new automobile was introduced last fall? (Lincoln-Zephyr)			
Total	38.97	14.87	46.16
Men	39.27	15.71	45.02
Women	37.61	11.11	51.28
What new car was styled by a woman designer? (Studebaker)			
Total	20.03	8.92	71.05
Men	19.73	8.24	72.03
Women	21.37	11.96	66.67

*Per cent of the number of persons questioned.

Mechanical Features of the '37 Ford



1—Phantom view of the all-steel body. Top, sides, rear panel, and floor are welded into a single unit which is reinforced by internal steel members. 2—Cross section of water pump on 60-hp. engine. The molded non-metallic impeller is held by spring tension against a ground and lapped surface on the pump body to form a water seal. The bearing bushing on the shaft is automatically lubricated with engine oil. 3—Battery carried in a recess in the forward side of the dash, where it is more accessible than below the floor. 4—Three-spoked steering wheel with spokes unevenly spaced to give a better view of the speedometer and other instruments. 5—Self-energizing brake. The primary shoe is forced into contact with the drum by the wedge, and the friction thus engendered is transferred through the sliding adjusting wedge to the secondary shoe, applying it with greater force than if both shoes were applied directly by the operating wedge. 6—The new cast alloy steel piston with cylindrically-ground skirt, and, 7—Spring-leaf lubrication through a high-pressure fitting, passage ways and grooves in the leaves.

Coming off the line at the Pontiac factory.

Production Lines

Sans Foundation

An amazing chapter in machine shop management has been written. We have it directly from D. A. Wallace, Chrysler vice-president in charge of manufacture, and it is of great interest to plant engineers and the machine tool manufacturers. It has to do with the mounting of machine tools for a new line-up and it all started when the Chrysler East Jefferson plant was tooling up its new motor lines. Now Chrysler uses anodized pistons and the anodizing tanks up to now have been mounted in suitable pits cut in the floor. A pit was dug and then the plant engineer was asked to change its location, which meant more expense. So Dave Wallace said no more pits. "Let's build a structural steel frame and set it on a sheet of heavy tar paper right on a cleaned section of the floor. Then fill it with concrete and set the tanks into it. Whenever the tanks have to be moved, just jack the foundation off the tar paper, and the job is done."

* * *

No more was said about this for almost four months, up to about a fortnight ago. Then somebody said something about the fact that the motor shop was running and that there weren't any holes in the floor. To make the story brief, Dave Wallace walked out into the motor shop and found that every machine in the plant, even including the huge Natco multiple drills and the big Cincinnati vertical and horizontal broaching machines, were laid down on the floor on pads of heavy tar paper and without any foundation bolts or fastenings of any kind. The curious thing about it is that the weight of the machine evidently caused a plastic flow in the tar paper and glue compound, which held the mounting to the floor so securely that the machine can't be budged without the aid of the heaviest jacks available.

* * *

Not only are the machines securely anchored but the mounting is so resilient that there is no longer a trace of the vibration in certain machines which heretofore vibrated sufficiently to loosen up the best foundation bolts.

* * *

The upshot of it is that it is Chrysler practice from this day on to mount machine tools without foundation pits or bolts or anything else. Which puts an end to holes or breaks in a nice floor. As a corollary to this, all machinery suppliers have been advised that from now on the machines will have to be supplied with well-machined pads on the base so as to provide an ideal surface for the unique fastening.

Pontalite

According to the *Industrial Bulletin*, Number 118, duPont will soon announce the commercial availability of Pontalite, a newcomer in the field of transparent organic glass. Chemically this molded glass is the methyl ester of methacrylic acid (more briefly methacrylate). It shares the lightness of the urea-formaldehyde, vinyl, and styrol types of plastics, but is said to exceed them in transparency and brilliancy. It may be molded into complex shapes or subjected to machining, drilling and cutting. The monomer from which the plastic is made can be poured into molds and polymerized, or used to impregnate cloth, paper or wood.

In other physical properties, Pontalite exhibits an unusual combination of qualities. In addition to unique clarity, this resin has a high softening temperature, high tensile and impact strengths, good dielectric properties, low specific gravity, light-stability, good ultraviolet transmission, and is unattacked by the usual inorganic reagents and some of the more common organic solvents. Although the resin is softer than glass, it is more surface-resistant than most other thermoplastics. One can readily restore original brilliance of a scratched surface by simple polishing procedure. The resin, due to its unusual clarity can be fabricated into delicate tinted shades and combined with varying amounts of dye or pigments.

Broaches Head

One of the latest of the surface broaching applications to make the grade is a huge horizontal machine tooled up to finish the top and bottom faces of cylinder heads. A trunnion type fixture is used to facilitate the operation, each head being handled twice to finish both sides. The finish is really remarkable for its smoothness and accuracy of dimension. —J. G.

Available publications sometimes mentioned on this page will henceforth be found regularly under "Publications Available." See page 814 in this issue.

MANUFACTURING MANAGEMENT METALLURGY

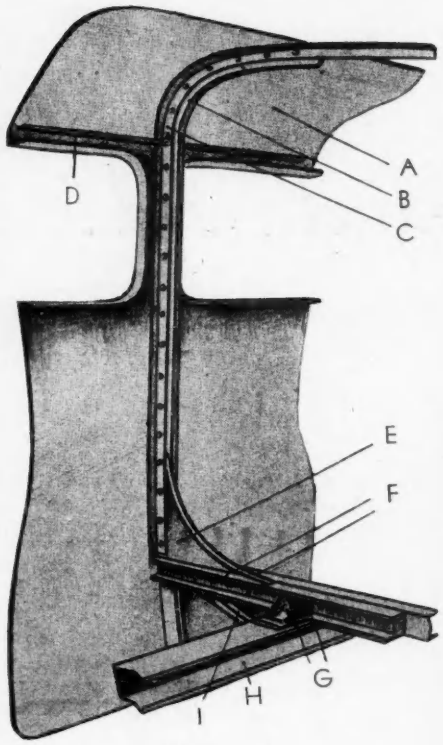


Fig. 1

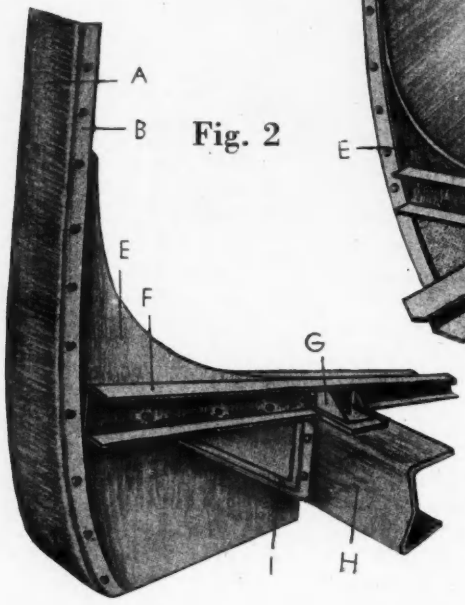


Fig. 2

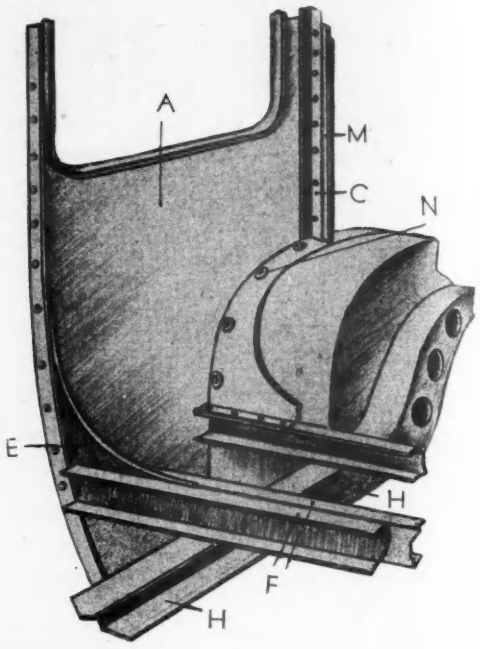
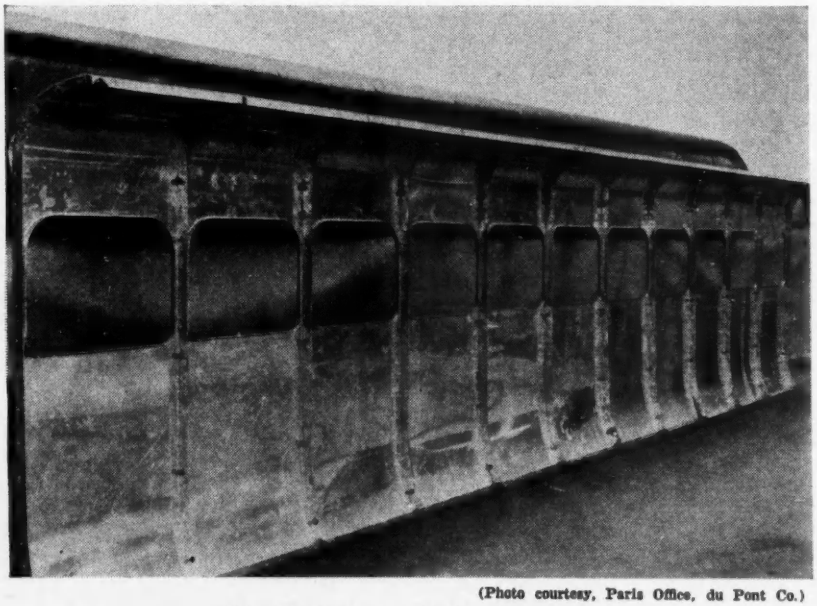


Fig. 3

A New Method of Bus Body C



(Photo courtesy, Paris Office, du Pont Co.)

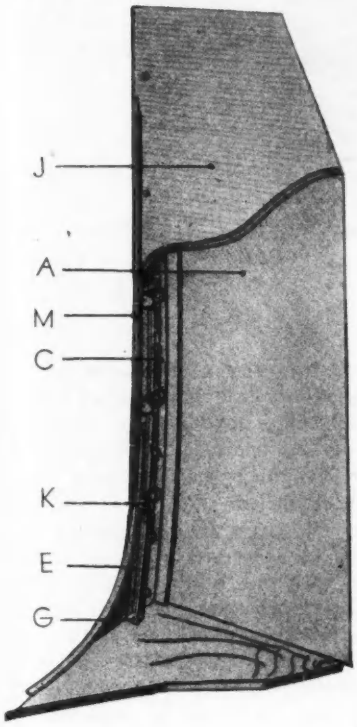
Fig. 7—Side panel of railcar body

A NEW system of body construction applicable particularly to the bodies of motor buses and railcars, has been developed in France under Viscaya patents by the coachbuilding firm of Million-Guiet, Paris. It is claimed to offer advantages from the standpoints of lightness, flexibility, durability, safety, comfort and ease of maintenance and repair, besides being economical to manufacture.

We are indebted to the Paris Office of the Du Pont Company for the following information on this system of body construction.

Figs. 1 to 6 illustrate the method of construction. The side walls of the body are assembled of sections made of aluminum sheet of from 0.080 to 0.100 in. thickness and from 35 to 50 in. in width. These sections have their edges flanged and they are bolted together by means of self-locking, parkerized bolts, with a layer of soft material between

Fig. 4



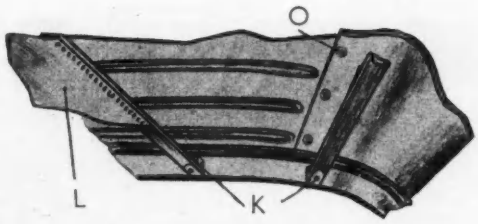


Fig. 5

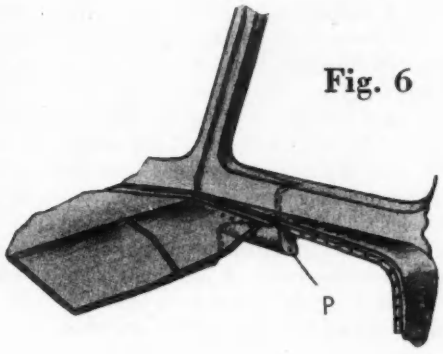


Fig. 6

Key to Reference Letters
on Figures 1, 2, 3, 4, 5 and 6

A. Section of outside wall (covering) of aluminum.
B. Flanged edge by means of which the sections are joined together.
C. Reinforcing strip used in connection with a baggage shelf.
D. Flange for junction with roof.
E. Sheet-steel gussets with flanged edges.
F. Cross channels by means of which the body is supported on the chassis.
G. Double gussets for connecting the body cross bars to the frame side rails.
H. Frame side rails.
I. Reinforcing brackets for the ends of body cross bars.
J. Interior body panels.
K. Lugs to which inside panels are secured (may be replaced by Q).
L. Fabric covering for under side of roof which is affixed to small wood brackets.
M. U channel by means of which the body panel sections are secured together.
N. Bolts for fastening wheel housing in place.
O. Bolts for bottom of luggage shelf.
P. Leather bellows.
Q. Wooden bracket to which inside panels are secured.

Figs. 1 and 2—Details of Viscaya body construction, showing how the panel sections are assembled and secured to the chassis
Figs. 3 and 4—Details of body construction and of the inside lining
Fig. 5—Details of the sheet-metal roof and its metal lining
Fig. 6—Flexible joint

y Construction

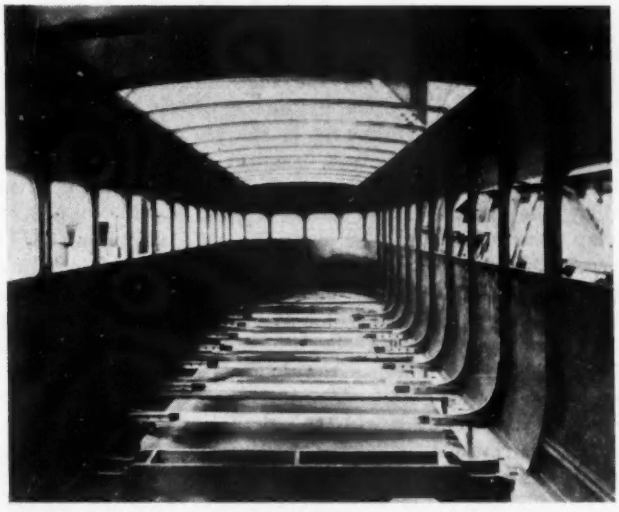


Fig. 8 — Interior view of outer shell of railcar body built on the Viscaya sectional plan.

(Photo courtesy, Paris Office, du Pont Co.)

the sections united. Thus an all-metal body with interchangeable removable sections is obtained.

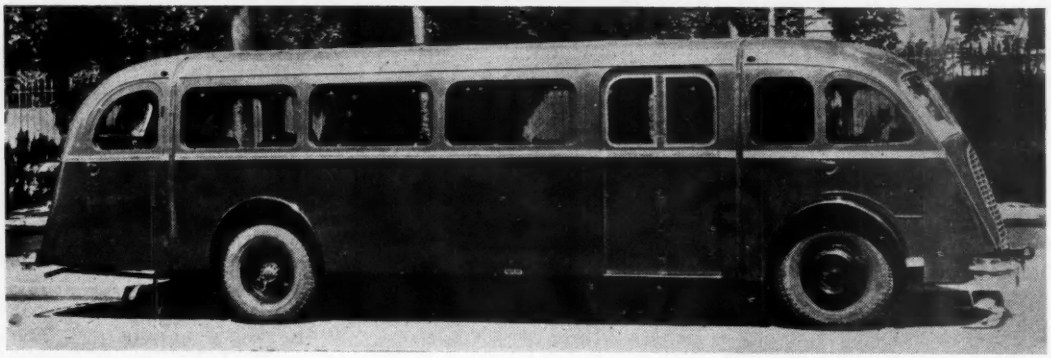
The body so constructed is entirely independent of the chassis frame. The latter is provided with transverse channel-section carriers of either pure aluminum or an aluminum-magnesium alloy. These carrier bars are secured to the frame and to the side walls of the body opposite each point therein, by means of double triangular gussets with flanged edges. (Figs. 1 and 2.) The sides of the body are connected to the superstructure by means of curved members designed to support the roof. (Figs. 1 and 5.) The latter may be either of hard or soft material. In case a baggage shelf is to be provided, the superstructure is suitably reenforced.

In contrast to conventional body designs, the one here described requires neither a carcass nor a framework, as a framework is automatically formed by the joints between adjacent panel sections. Each section is stiffened by a turned-over edge extending around the entire panel.

The usual interior covering is similarly sectioned. Its sections correspond exactly to those of the outer shell and are secured thereto by means of lugs or filler brackets. A molding of suitable section covers the joint, and its method of fastening is such that each section can be removed in a few minutes.

This method of construction is applicable to motor vehicles and to rail cars. Railcar bodies, however, incorporate a number of special arrangements which are the result of a thorough study of all modern requirements.

A special elastic connection of the body to the chassis frame further increases the suppleness of the mounting and prevents the transmission of vibra-



(Photo courtesy, Paris Office, du Pont Co.)

Fig. 9—Citroen bus with aluminum sectional body (about 1760 lb. was saved by the use of aluminum).

tions from the engine or the chassis to the body.

The deformability of the body resulting from the flexible connection of the various sections, obviates any trouble from want of absolute flatness of the chassis frame. As a matter of fact, it is quite difficult to produce a frame which is not slightly distorted. If the vehicle body were a single rigid shell, it would be subjected to great shearing stresses when fastened down to such a chassis. Moreover, when a body is fastened down to such a frame it is necessary to draw it out of position, which not only prevents a secure mounting but interferes with proper operation of doors and window regulators. By the Viscaya system, the doors are incorporated each in one section of the side panel of the body. Instead of aluminum, sheet steel of 0.060 in. gage is used for the door section and is formed into a door post of hollow square section, with the inner wall stamped with numerous louvers for the sake of lightness. The inner panel of this section is made of steel of 0.040 in. thickness. By thus incorporating the door in one of the body sections it is possible to have a rigid door in a flexible body, which assures perfect operation of the door no matter how much the body as a whole may be deformed.

In special cases the side panels may be made of sheet steel instead of aluminum, with the result that the weight is slightly increased and the cost reduced. Another advantage of this system is that by using different numbers of sections bodies of different length can be built up from the same units.

Fuel Distribution in Aircraft Engines

THE distribution of the fuel between the various cylinders of an aircraft engine is a subject of considerable importance, because of its effects on fuel economy and vibration. The design of the intake system may cause some of the cylinders to receive leaner mixtures than others. Carburetor adjustments made to enrich the lean cylinders will also enrich the normal mixture in the other cylinders and thus increase the fuel consumption of the engine. The variation of the power generated in the cylinders causes variations in torque and consequent engine vibration.

Considerable work on engine distribution has been done in the past, and one notable contribution to the subject, by Hector Rabezzana and Stephen Kalmar, appeared in AUTOMOTIVE INDUSTRIES of March 19 and 26, 1932. These investigators found that the temperature reached by the spark plug is a fairly accurate index of the mixture ratio in that cylinder. A new investigation on mixture distribution has been carried out by the National Advisory Committee for Aeronautics on a Pratt & Whitney engine operating at between 340 and 487 hp. output, 0.42 and 0.59 lb. per i, hp.-hr. specific consumption and 1665 and 1800 r.p.m. An account of the tests and the results obtained is given in N.A.C.A. Technical Note No. 583, "Mixture Distribution in a Single-Row Radial Engine," by Harold C. Gerrish and Fred Voss. The induction system of the engine consisted of an air scoop, a carburetor, and a blower operating at 12 times engine speed. From the blower, nine tubes of equal length and diameter carried the fuel mixture to the cylinders.

Samples of exhaust gas were collected from the various exhaust stacks and the samples were analyzed to determine the relation of CO_2 CO and fuel wasted to the air-fuel ratio. From the results thus obtained, linear relations between the air/fuel ratio and the various exhaust elements were established and charts were drawn to represent the relationships. For the remainder of the work only the CO_2 content was determined directly and the other factors were obtained from the charts.

The following conclusions were arrived at from the results of the experimental work by the committee:

The variation in the quality of the mixture, as measured by the air/fuel ratio, among the different cylinders was independent of the power output, specific fuel consumption, and engine speed.

The variation in the quality of the mixture among the different cylinders was approximately 4 per cent.

The mixture was richer in the top cylinders than in the bottom ones.

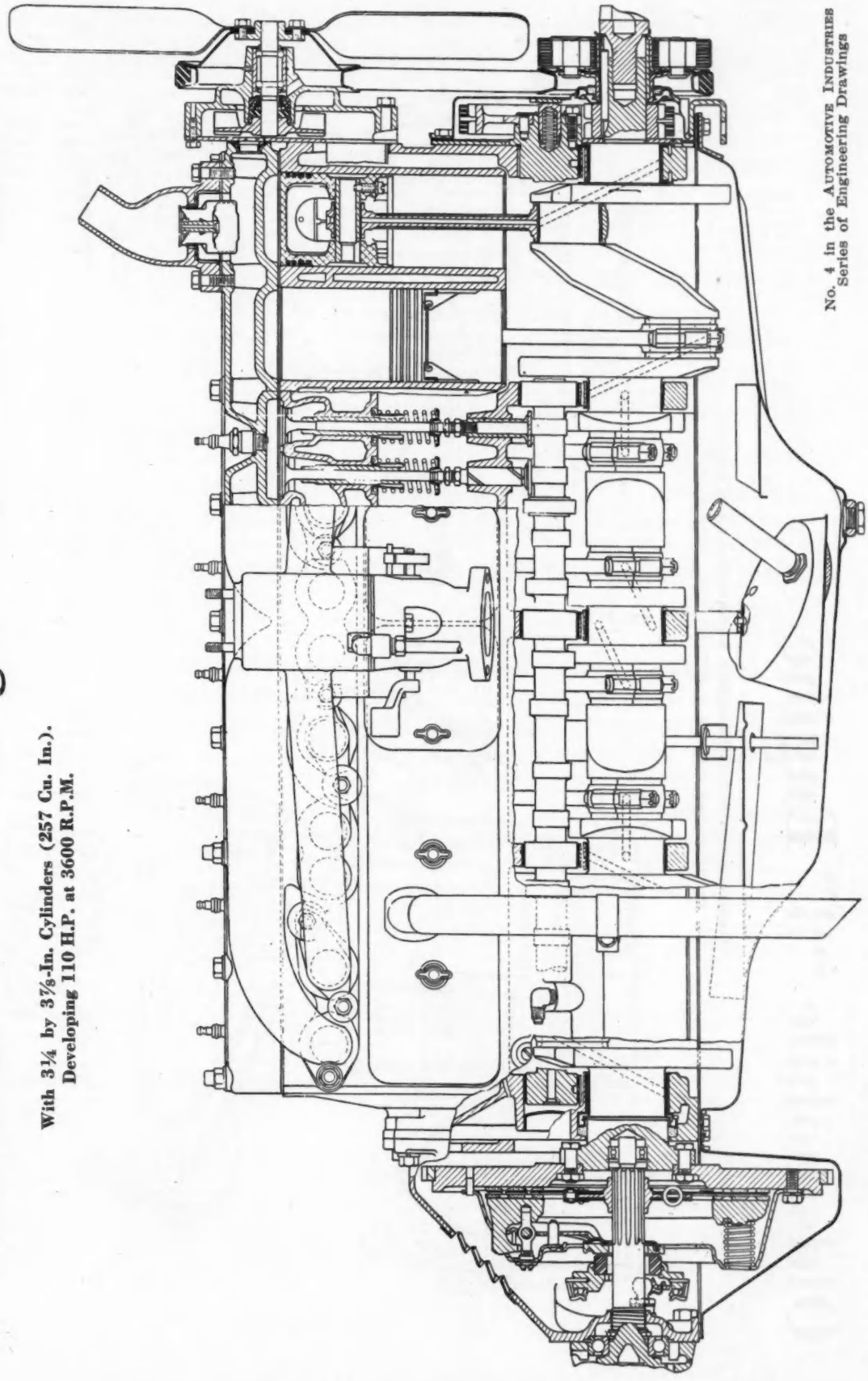
For a range of air/fuel ratios from 10 to 13, the temperature of the rear spark-plug boss was not a good index of the quality of the mixture in the cylinder.

USL Battery Gives Bonus Equal to One Week's Pay

R. T. Pierson, vice-president and general manager of the USL Battery Corp., has announced an employe bonus equivalent to one week's pay, to be paid Dec. 24. In addition to the bonus payment, one week's vacation with pay was granted for 1937 to all employes who had not previously been granted a vacation.

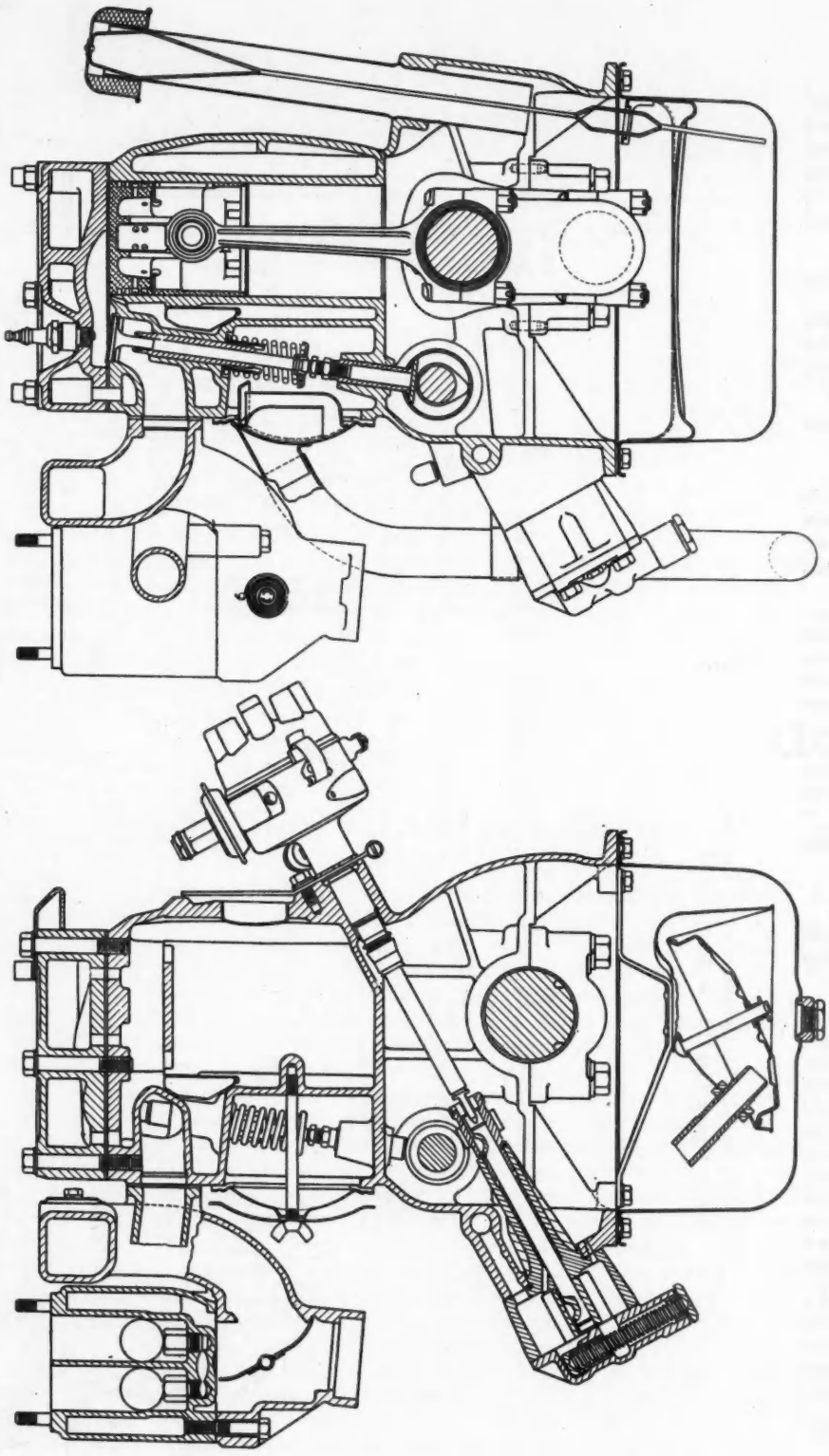
Oldsmobile "8" Engine for 1937 Line

**With 3¼ by 3⅞-In. Cylinders (257 Cu. In.).
Developing 110 H.P. at 3600 R.P.M.**



No. 4 in the AUTOMOTIVE INDUSTRIES Series of Engineering Drawings

Oldsmobile "8" Engine



Transverse sections of Oldsmobile Eight engine taken between cylinders and through a cylinder axis, respectively.

STEERING, FRONT AXLE, BRAKES

Line Number	CAR MAKE AND MODEL	STEERING: Gear Type	STEERING: Gear Make	STEERING: Linkage—Type	STEERING: No. of Turns of Wheel for Left to Right Swing	STEERING: Car Turning Radius (Minimum)	STEERING: Caster—(Deg.)	STEERING: Camber—(Deg.)	STEERING: Toe-in—(Inches)	STEERING: Kingpin Inclination (Deg.)	STEERING: Wheel Make	STEERING: Wheel Diam. (Ins.)	FRONT AXLE: Make	FRONT AXLE: Section Type	FRONT AXLE: End Type	FRONT AXLE: Minimum Road Clearance	FOOT BRAKE: Make	FOOT BRAKE: Type	FOOT BRAKE: Shoe-anchor	FOOT BRAKE: Power-unit—Make	FOOT BRAKE: Type Lining	FOOT BRAKE: Drum: Material	FOOT BRAKE: Drum: Diameter	FOOT BRAKE: Lining: Length per Wheel	FOOT BRAKE: Lining: Width	FOOT BRAKE: Lining: Thickness	FOOT BRAKE: Clearance: Toe	FOOT BRAKE: Clearance: Heel	FOOT BRAKE: Total Braking Area	FOOT BRAKE: Per Cent Braking on Rear	HAND BRAKE: Operates on	HAND BRAKE: In-or External	HAND BRAKE: Drum Diameter	HAND BRAKE: Lining: Length per Drum	HAND BRAKE: Lining: Width	HAND BRAKE: Lining: Thickness	HAND BRAKE: Lining: Clearance	Line Number
1	American-Bantam																																						1
2	Auburn 654	CL	Ross				3.5-4	1½	⅛+	7½		17	Col	I	RE		Ben	Hy		No	Mo	Stl	12	24	1½	⅛	.010	.010	145.6	50.0	RS	In	12	24	1½	⅛	.010	2
3	Auburn 852	CL	Ross		3½		2-3	1½	⅛+	7½		17	Col	I	RE		Ben	Hy		No	Mo	Cen	12	24	2	⅛	.010	.010	194.2	50.0	RS	In	12	24	2	⅛	.010	3
4	Auburn SC-852	CL	Ross		3½		2-3	1½	⅛+	7½		17	Col	I	RE		Ben	Hy		No	Mo	Cen	12	24	2	⅛	.010	.010	194.2	50.0	RS	In	12	24	2	⅛	.010	4
5	Buick 37-40	WR	Sag	D-TR	4	19½	−⅛+⅝	−¼+1	0−⅛	4.0	In, Sh	18	No	No	No	7⅛	Own	Hy	R	No	Wo	Cen	12	22	1¾	⅛	.010	.010	158.7	47.0	RS	In	12	22	1¾	⅛	.010	5
6	Buick 37-60	WR	Sag	D-TR	4½	21.0	−⅛+⅝	−¼+1	0−⅛	4.0	In, Sh	18	No	No	No	7⅛	Own	Hy	R	No	Wo	Cen	12	22	2	⅛	.010	.010	181.4	47.0	RS	In	12	22	2	⅛	.010	6
7	Buick 37-80	WR	Sag	D-TR	4¾	22.0	−⅜+⅝	−¼+1	0−⅛	4¾	In, Sh	18	No	No	No	7¾	Own	Hy	R	No	Wo	Cl	12	22	2	⅛	.010	.010	181.4	47.4	RS	In	12	22	2	⅛	.010	7
8	Buick 37-90	WR	Sag	D-TR	4¾	24.0	−⅜+⅝	−¼+1	0−⅛	4½	In, Sh	18	No	No	No	8⅛	Own	Hy	R	No	Wo	Cl	14	26	2	⅛	.010	.010	214.6	47.4	RS	In	14	26	2	⅛	.010	8
9	Cadillac V8-80	WF	Sag				−¼+1½	¼−1	0−⅛	4° 51′	Sh		No	No	No		Ben	Hy		No	Mo	Cen	12	25⅞	2	⅛	.010	.010	220	45½	RS	In	12	25⅞	2	⅛	.010	9
10	Cadillac V8-85	WR	Sag		4¼		0±¼	0-½	0−⅛	5° 38′	Sh		No	No	No		Ben	Hy		No	Mo	Cen	12	25⅞	2	⅛	.010	.010	220	44	RS	In	12	25⅞	2	⅛	.010	10
11	Cadillac V8-70	WR	Sag		4¼	22.5	0±¼	0-½	0−⅛	5° 38′	Sh		No	No	No		Ben	Hy		No	Mo	Cen	12	25⅞	2	⅛	.010	.010	220	44	RS	In	12	25⅞	2	⅛	.010	11
12	Cadillac V8-75	WR	Sag		4½	23.5	0±¼	0-½	0−⅛	5° 38′	Sh		No	No	No		Ben	Hy		No	Mo	Cen	14	30	2¼	¼	.010	.010	257.5	42	RS	In	14	30	2¼	¼	.010	12
13	Cadillac V12-85	WR	Sag			23.5	0±¼	0-½	0−⅛	5° 38′	Sh		No	No	No		Ben	Hy		No	Mo	Cen	14	(g)	2¼	¼	.010	.010	257.5	42	RS	In	14	(g)	2¼	¼	.010	13
14	Cadillac V16-90	WR	Sag		4	23.5	0±¼	0-½	0−⅛	4° 30′	Sh		No	No	No		Ben	Hy		Ben	MW	Cl	14	(g)	2¼	¼	.010	.010	257.5	45	RS	In	14	(g)	2¼	¼	.010	14
15	Chevrolet Master	WS	Own	Con			3⅛	1±½	⅛−⅛	7½	Own	17	Ow	I	RE	8½	Own	Hy	R	No	Mo	CIS	11	22½	1¾	1/16			158.2	47½	RS	In	11	22½	1¾	1/16		15
16	Chevrolet Master De Luxe	WR	Own	Con			0	¼-¾	⅛−⅜	7¾	Own	17	Ow	No	No	9⅞	Own	Hy	R	No	Mo	CIS	11	22⅛	1¾	1/16			158.2	47½	RS	In	11	22⅛	1¾	1/16		16
17	Chrysler Royal C-16	WR		D-DL			1½	−¼+½	0−⅛	4¾-6		18Sr	No	No	No	8¼		Hy	R	No	Mo	Cen	10	(d)	2	1/16	.012	.006	148.4		DS	Ex	6	16⅛	2	1/16	.025	17
18	Chrysler Imperial C-14	WR		D-DL			1½	−¼+½	0−⅛	4¾-6		18Sr	No	No	No	8⅝		Hy	R	No	Mo	Cen	11	22½	2	1/16	.012	.006	177¼		DS	Ex	6	16⅛	2	1/16	.025	18
19	Chrysler Custom Imperial C-15	WR		Con									No	No	No	9⅞		Hy	R	Yes	Mo	Cen	13	24	2	¼	.012	.006	198.8		DS	Ex	7	21½	2½	1/16	.025	19
20	Chrysler Airflow C-17	WR		Con								18Sr	No	No	No	9⅛		Hy	R	Yes	Mo	Cen	13	24	2	¼	.012	.006	198.8		DS	Ex	7	21⅝	2½	1/16	.025	20
21	Cord Front Drive 812	RT	Gem	D-TR	3½	23.0	1-2½	1	0−⅛ h	6	Sh	17¼		Fr D	rive	9¼	Ben	Hy	R	No	MW	Cen	11	24	2¼	¼	.010	.010	216.0	50	RS	In	11	24	2¼	1/16	.010	21
22	De Soto S-3	WR		D-DL			1-1½	−¼+½	0−⅛	4¾-6		18Sr	No	No	No	8¼		Hy	R	No	Mo	Cen	10	(d)	2	1/16	.012	.006	148.4		DS	Ex	6	16⅛	2	1/16	.025	22
23	Dodge D-5	WR		Con			1-3	¼-¾	0−⅛	4½-5½		17Sr		Tu	RE	8⅛		Hy	R	No	Mo	Cl	10	(d)	2	1/16	.012	.006	148.4	40	DS	Ex	6	16⅛	2	1/16	.025	23
24	Duesenberg 8	CL	Ross	Con	4		3	¼						Ow	I	RE		LH	Hy	R	Ben	Mo	Cl	15	28¾	2¼	¼	.010		259.3	50	DS	Ex	7¾	16½	3	¼	.025	24
25	Ford V8-60	WR		Con			8	1	1/16−⅛	8					RE																							25
26	Ford V8-85	WR		Con			8	1	1/16−⅛	8					RE																							26
27	Graham Crusader 85	CL	Ross	Con	3		4½-5½	1	1/16-⅛	7½		16	Spi	I	RE	9¼	Own	Hy	R	No	Mo	Steel	9	18	1¾	1/16			126.0	50	RS	In	9	18	1¾	1/16		27
28	Graham Cavalier 95	CL	Ross	Con	3		4-4½	1	1/16-⅛	7½		17	Spi	I	RE	7	Own	Hy	R	No	Mo	Steel	9	18	1¾	1/16			126.0	50	DS	Ex	6	17¾	2	1/16		28
29	Graham Supercharger 116	CL	Ross	Con	3		3-4	1	1/16-⅛	7½		17	Spi	I	RE	8⅛	Own	Hy	R	No	Mo	Cl	11	23	1¾	¼			161.0	50	DS	Ex	6	17¾	2	1/16		29
30	Graham Supercharger 120	CL	Ross	Con	3		3-4	1	1/16-⅛	7½		17	Spi	I	RE	8⅛	Own	Hy	R	No	Mo	Cl	11	23	1¾	¼			161.0	50	DS	Ex	6	17¾	2	1/16		30
31	Hudson 73	WR	Gem	Con	4.187	42.5	0-½	1-1½	0-.125	7.0	Sh	18	Ow	I	E	8.56	Ben	Hy	R	No	Mo	AS	10.06	22.12	1.75	.218	.010	.010	154.8	50	RS	In	10.06	22.12	1.75	.218	.010	31
32	Hudson 74-5-6-7	WR	Gem	Con	4.187	(f)		1-1½	0-.125	7.0	Sh	18	Ow	I	E	8.56	Ben	Hy	R	No	Mo	AS	11.06	23.93	1.75	.218	.010	.010	167.5	50	RS	In	11.06	23.93	1.75	.218	.010	32
33	La Salle 37-50	WR	Sag			4⅓	−¼+½	¼-1	0−⅛	4° 51′	Sh		No	No	No	No	Ben	Hy		No	Mo	Cen	12	25⅞	2	1/16	.010	.010	220.0	45½	RS	In	12	25⅞	2	1/16	.010	33
34	Lincoln Zephyr	WR	Own			22	4	¾	1/16-⅛			17	Ow	I	RE																FW	In						34
35	Lincoln V12		Own										Ow									Cl															35
36	Nash Lafayette 400-3710	WR	Gem	Con		22′ 4½″	2½	1½	1/16°	.7.0		18	Ow	I	RE	7¾	Ben	Hy		No		Cl	10½		2		.010	.010	177.0	47.0	RS	In	10½		2		.010	36
37	Nash Ambassador 6-3720	WR	Gem	Con		21¾	2½	1½	1/16°	7.0		18	Ow	I	RE	7¾	Ben	Hy		No		Cl	10½		2		.010	.010	177.0	47.0	RS	In	10½		2		.010	37
38	Nash Ambassador 8-3780	WR	Gem	Con		22′ 7½″	2	1½	1/16°	7.0		18	Ow	I	RE	7⅝	Ben	Hy		No		Cl	11¼		2¼		.010	.010	215.8	47.0	RS	In	11¼		2¼		.010	38
39	Oldsmobile F-37	WR	Sag	CP		18½	¼-1	½-1	⅛−⅛	4° 51½″	Ini	18	No	No	No		Ben	Hy	R	No	MW	Cl	11	21⅛	1¾	⅛	.010	.010	148.0	45.0	RS	In	11	21⅛	1¾	⅛	.010	39
40	Oldsmobile L-37	WR	Sag	CP		20.0	¼-1	½-1	1/16-⅛	4° 51½″	Own	18	No	No	No		Ben	Hy	R	No	MW	Cl	12	23.05	1¾	1/16	.010	.010	162.0	45.0	RS	In	12	23.05	1¾	1/16	.010	40
41	Packard Six	WR	Own	CP		19′ 2″	2±½	1±¼	1/16±1/16	1½		18Sr	No	No	No			Hy	R	No	(a)	Cen	11	13	1¾	1/16	.010	.010	168.0		RS	In	11	13	1¾	1/16	.010	41
42	Packard 120-C	WR	Own	CP		19′ 6″	2±½	1±¼	1/16±1/16	1½		18Sr	No	No	No			Hy	R	No	(a)	Cen	12	13	1¾	1/16	.010	.010	182.0		RS	In	12	13	1¾	1/16	.010	42
43	Packard Super Eight	WR	Own	CP	5	(l)	2±½	1±¼	1/16±1/16	1½		18½Sr	No	No	No			Hy	R	No	(b)	Cen	12	13	2½	1/16	.010	.010	260.0		RS	In	12	13	2½	1/16	.010	43
44	Packard Twelve	WR	Own	CP	5	(c)	0+0-½	1±¼	1/16±1/16	1½		18½Sr	No	No	No			Hy	R	Yes	(a)	Cen	14	15⅛	2¾	¼			330.0		RS	In	14	15⅛	2¾	¼		44
45	Pierce-Arrow 1701	CL	Ross	Con		(k)	¾	1	¼	8.0	Sh	19½	Ow	I	RE		SW	Mec		Ben	Mo	CS	16	38	2¼	¼	.012	.012	342.0	45	RS	In	16	38	2¼	¼	.012	45
46	Pierce-Arrow 1702	CL	Ross	Con	3¾	(k)	¾	1	¼	8.0	Sh		Ow	I	RE		SW	Mec		Ben	Mo	CS	16	38	2¼	¼	.012	.012	342.0	45	RS	In	16	38	2¼	¼	.012	46
47	Pierce-Arrow 1703	CL	Ross	Con	3¾	24¾	¾	1	¼	8.0	Sh		Ow	I	RE		SW	Mec		Ben	Mo	CS	16	38	2¼	¼	.012	.012	342.0	45	RS	In	16	38	2¼	¼	.012	47
48	Plymouth P-3	WR		Con			1-3	¼-¾	0−⅛	4½-5½		17Sr		Tu	RE	8⅛		Hy	R	No	Mo	Cen	10	(d)	2	1/16	.012	.006	148.4		DS	Ex	6	16⅛	2	1/16	.025	48
49	Plymouth P-4	WR		Con			1-3	¼-¾	0−⅛	4½-5½		17Sr		Tu	RE	7⅞		Hy	R	No	Mo	Cen	10	(d)	2	1/16	.012	.006	148.4		DS	Ex	6	16⅛	2	1/16	.025	49
50	Pontiac De Luxe Six 37-26 CA	WR	Sag	CP		36′ 5″	0	1	0	4-51½	Ini	18	No	No	No		Ben	Hy	R	No	Mo	CN	12	23½	1¾	1/16	.010	.010	161	48	RS	In	12	23½	1¾	1/16	.010	50
51	Pontiac De L. Eight 37-28 CA	WR	Sag	CP		39′ 5″	0	1	0	4-51½	Ini	18	No	No	No		Ben	Hy	R	No	Mo	CN	12	23½	1¾	1/16	.010	.010	161	48	RS	In	12	23½	1¾	1/16	.010	51
52	Studebaker Dict. & Dict. Pl. 6	CL	Ross	Cr	4		1½ (r)	1½ (r)	⅛−⅛	9½	Sh	18″	Ow	I	RE		LH	Hy	R	No	WM	Be	11	19½	1¾	1/16	.010	.005	138	45	RS	In	11	19½	1¾	1/16	(e)	52
53	Studebaker President	CL	Ross	Da			−¼+½	½	1/16-⅛	8½	Sh	18″					LH	Hy	R	No	WM	Be	12½	21½	1¾	¼	.010	.005	150½	45	RS	In	11	21½	1¾	¼	(e)	53
54	Terraplane 71	RT	Gem	Con	4.18	40.5	0-½	1-1½	0−⅛	7.0	Sh	17	Ow	I	E	8.56	Ben	Hy	R	No	Mo	As	10.06	22.12	1.75	.218	.010	.010	154.8	50	RS	In	10.06	22.12	1.75	.218	.010	54
55	Terraplane 72	RT	Gem	Con	4.18	40.5	0-½	1-1½	0−⅛	7.0	Sh	17	Ow	I	E	8.56	Ben	Hy	R	No	Mo	As	10.06	22.12	1.75	.218	.010	.010	154.8	50	RS	In	10.06	22.12	1.75	.218	.010	55
56	Willys 37	WG	Gem	Con	2¼	15½	3	2	1/16	7½	AHR	17	Ow	I	RE	7.0	Ben	Mec	R	No	Mo	10.20	9.00	19 1/16	1¾	1/16	.010	.010	134 1/16	55	RS	In	9.00	19 1/16	1¾	1/16	.010	56

*—Maximum
(a)—Primary US 714—Secondary US 589
AA—Automatic Adjustment
AS—Alloy Steel
(b)—Primary Marshall 1035—Secondary Marshall 600
Be—Budd Composite Ben—Bendix
(c)—Mod. 1506, 24 ft., 1507, 24½ ft., 1508 25 ft. 8½ in.
Cen—Centrifuse Ci—Cast Iron
Cia—Cast Iron Alloy
CIS—Cast Iron and Steel Composite
CL—Cam and Lever
CN—Chrome Nickel Iron
Col—Columbia Axle Co.
Con—Conventional Type
CP—Center Point Type
CR—Cross Linkage
CS—Carbon Steel
(d)—Front 19⅛, Rear 17⅛
Da—Direct Action Type
D-DL—Double Drag Link
DS—Drive Shaft
D-TR—Dual Tie Rod
(e)—Toe .010, Heel .005
E—Elliot Type Ex—External
(f)—Mod. 74 & 5-42½ ft.; Mod. 76 & 7-45 ft.
Fw—All Four Wheels
(g)—Primary 12¼, Secondary 15
Gem—Gemmer
(h)—Tow Out—Never In
Hy—Hydraulic
I—I-Beam Type
In—Internal Ini—Inland
In, Sh—Inland or Sheller
(k)—138 WB-23¼ ft.; 144 WB-24½ ft.
(l)—Mod. 1500, 22 ft.; 1501, 23 ft. 3½ in.; 1502, 23 ft. 9 in.
LH—Lockheed Hydraulic
Mec—Mechanical Mo—Moulded
MW—Molded-Primary, Woven-Secondary
Ow—Own
(r)—Dict. Planer, caster—¼+½, camber ½
R—Rigid RE—Reverse Elliot
RS—Rear Service Brakes
RT—Roller Tooth
Sag—Saginaw Sh—Sheller
Sr—Steel—Rubber Covered
S-St—Semi Steel
SW—Stewart-Warner
Tu—Tubular
WM—Woven-Primary, Moulded-Secondary
WR—Worm and Roller
WS—Worm and Sector

Just Among Ourselves

(*Continued from page 815*)

140,000 x 778 = 110,000,000 ft.-lb. Now the draft (or resistance to motion) of an average low-priced American car at the low speed of 20 m.p.h. is in the neighborhood of 75 lb. At high speeds it is much higher. If the car runs 25 miles on a gallon of gasoline, then the energy actually spent in overcoming the resistance to motion is

$$75 \times 5280 \times 25 = 10{,}000{,}000 \text{ ft.-lb. (roughly)},$$

so that the over-all efficiency is

$$\frac{10{,}000{,}000 \times 100}{110{,}000{,}000} = 9 \text{ per cent.}$$

If the car runs 200 instead of 25 miles per Imperial gallon, then the over-all efficiency will be eight times as great, or 72 per cent.

Engines Lose Power

WHILE it is true that the over-all efficiency in normal operation is comparatively low and that the losses are large (91 per cent in the example cited), we know that the carburetor can be held responsible for only a very small part of those losses. Even when it is supplied with an absolutely perfect mixture, the engine will still throw a lot of heat into the cooling system (more than goes into useful work) and a similar quantity will be contained in the exhaust gases. Another cause for the great losses lies in the low power factor at which the engine works. In the above example of a car having a total resistance to motion at 20 m.p.h. of 75 lb., the actual power delivered to the road wheels is 4 hp. The engine probably is capable of 80-90 hp. and we cannot expect a 90-hp. engine to work very efficiently at 4 hp.

A sketch has been published to explain the principle of operation of the carburetor for which these remarkable results are claimed. It shows that a rich mixture is produced first, by spraying gasoline from jets into a primary mixing chamber. This latter has a spiral passage through which the mixture passes from the outer to the inner end. While so doing it absorbs heat from the end walls, which are heated by the exhaust gases. It then passes through another, similar, secondary mixing chamber, but from the inner to the outer end of the spiral passage, and is finally discharged into the air tube (or throat) of the carburetor, where it is diluted with air which enters the air tube on top, flowing past a choke valve, and after being mixed with the rich mixture from the mixing chambers, on past the throttle valve and into the inlet manifold.

There is, of course, nothing new in applying heat to a fuel mixture, as that has been done for many years; only in recent years the tendency has been to cut down the amount of heat supplied, because this heat tends to reduce the output of the engine. There is also nothing new in supplying the heat to an over-rich mixture which is later diluted by adding more air, as that has been done before, especially in connection with kerosene and other heavy fuels requiring a large amount of heat for their vaporization.

The sketch therefore fails to show any features hitherto unknown in carburetor practice, and absolutely gives no warrant for crediting the remarkable results claimed. In view of the fact that similar claims have been made before repeatedly in our experience, and each time have proved absolutely unfounded in the end, we shall remain exceedingly skeptical until we see the claims demonstrated, or are furnished test results obtained by some institution in which we have confidence.—P.M.H.

Census Shows Vast Motor Gains

(*Continued from page 811*)

earners in these plants were 387,725 in 1933 compared with 243,614 in 1932, 285,515 in 1931, and 447,448 in 1929. Wages amounted last year to $545,402,646, against $252,106,467 in 1933; $350,526,346 in 1931 and $733,082,618 in 1929. Value added through manufacture is fixed at $1,124,717,041 in 1935, against $650,770,218 in 1933; $951,581,634 in 1931 and $2,002,225,667 in 1929.

The above figures are broken down to show that there were 121 vehicle manufacturers in 1935 compared with 122 in 1933, 178 in 1931 and 210 in 1929. These plants employed the following numbers of wage earners: 1935, 146,960; 1933, 97,869; 1931, 134,866; 1929, 224,688. Wages paid amounted to $217,037,018 in 1935; $103,784,905 in 1933; $156,755,887 in 1931 and $364,457,339 in 1929. Total value of products made in motor vehicle plants was $2,391,056,395 in 1935; $1,096,946,283 in 1933; $1,567,526,262 in 1931 and $3,709,514,988 in 1929. Value added by manufacture was $576,952,275 in 1935, $329,178,005 in 1933, $523,120,360 in 1931 and $1,314,954,370 in 1929.

Complete motor vehicles and chassis numbering 3,922,746 valued at $2,152,477,274 were manufactured in 1935, compared with 1,848,013 valued at $928,649,967 in 1933 and 2,295,063 valued at $1,387,173,498 in 1931. Of these, 3,212,835, valued at $1,752,794,114, were in 1935 passenger vehicles, not including buses and taxicabs; 1,534,366, valued at $753,133,689, in 1933; and 1,911,717, valued at $1,119,816,868, in 1931. Motor buses produced in 1935 amounted to 4802, valued at $27,104,438; in 1933, 1574 valued at $6,947,847; and in 1931, 4241 valued at $17,926,575. Trucks built in 1935 amounted to 505,237, valued at $271,206,236; in 1933, 213,683, valued at $110,765,361; and in 1931, 243,647, valued at $159,210,971.

Metallurgy of Tractor Axles

AXLES of farm tractors generally fail in torsion at the small spline at the differential end, in contrast to certain industrial axles, which are so greatly overloaded that bending-type failures occur. The failures of fractured axles may be divided into three groups according to the nature of the fracture: Some fail by smooth shear in the small spline, others by shatter, and still others from fatigue cracks extending inward from the roots of the splines.

The load capacity of axles evidently may be varied in four ways, viz.: (1) by changing the hardness and consequently the physical properties of a given steel; (2) by changing the steel; (3) by changing both, and (4) by changing the design of the axle. An investigation on the physical properties of axle shafts in which all of these methods were considered was dealt with in a paper by H. W. Knowlton, metallurgical engineer, Gas Power Engineering Department, International Harvester Company, at the recent Cleveland meeting of the American Society for Metals.

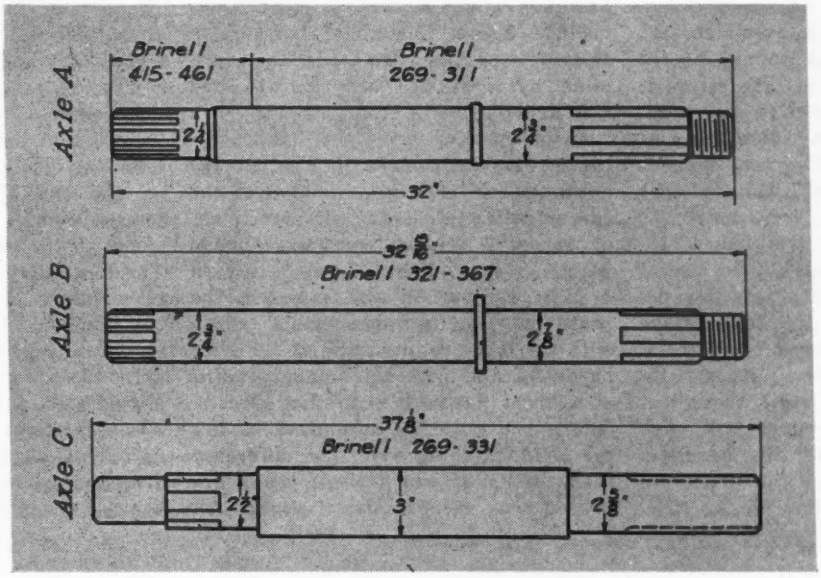


Fig. 1—Designs of typical tractor axles

At the plant with which the author is connected, regular production axles are made of 3140 steel of 6-8 grain size, and most of the experimental work was done on steel of this specification. The surface hardness varies somewhat with different axles and a very important problem was to determine the hardness range which would produce the most favorable combination of physical properties for each of three axle designs (Fig. 1) made of this steel.

In the course of the investigation, hardness, tensile, notched-bar-impact, impact-tensile, repeated-impact, static-torsion, rotating-beam-fatigue, and torsion-fatigue tests were applied, and these tests were discussed by Mr. Knowlton in his paper from the standpoint of the bearing of their results on the problem in hand.

In making fatigue tests it is customary to run a series of specimens at stresses decreased in steps and plot the stress against the number of cycles forming an S-N curve. In the case of steel, the curve becomes fairly flat after several million cycles of stress. It is usually assumed that a stress which does not cause failure within 10 million cycles can be withstood indefinitely; consequently, such a stress is commonly considered as the endurance limit in fatigue. In the present investigation the S-N curves were considered sufficiently flat for estimating purposes after 2-5 million cycles of stress.

In applying this test to engineering problems, it is frequently more important to determine the stress which can be withstood for a number of cycles corresponding to the expected maximum service of the production article under consideration. For example, the axle shaft of a passenger car during the entire life of the car probably does not encounter even 100,000 cycles of the maximum stress, which occurs only under conditions of full engine torque and low gear operation.

French has shown that applying a stress above the endurance limit for a relatively small number of cycles may even raise the endurance limit. He plots a "damage line" on the S-N diagram, which shows the number of cycles of stresses of different magnitude which can be withstood without reducing the endurance limit. In the case of tractor axles, however, it is probably the actual endurance limit, which is of the most importance, because such axles may actually encounter millions of cycles of low gear operation with almost full engine torque applied.

The principal difficulty in applying the results of the rotating-beam-fatigue test to the study of axles, gears and other production parts lies in the fact that such parts must necessarily have fillets with radii much smaller than those of the test specimen. As a result, the endurance limit as determined by the rotating beam test is frequently much higher than that obtained by performing a fatigue test on the actual production article (assuming that the ordinary methods for figuring stresses are employed). The rotating beam endurance limit may be said to be a figure which may be approached but seldom reached by production articles.

A special torsion-fatigue test was applied to axles by the author. In this test one end of the axle is held stationary, while a torsional load is alternately applied to and released from the other end of the axle by means of a long lever arm actuated by an eccentric. The load is applied to the splines by means of a chuck in the lever arm. In other words, it is attempted to simulate service conditions as nearly

Materials Used for Preliminary Tests
S.A.E. 3140 Steel

Test	Size	Bar	Chemical Analysis C	Mn	S	P	Ni	Cr	Grain Size and Normality
Fatigue—	5/8" Rd.	1	0.38	0.72	0.021	0.013	1.28	0.61	4– N
(Rotating Beam)	5/8" Rd.	2	0.40	0.75	0.024	0.013	1.27	0.62	4– N
	5/8" Rd.	3	0.38	0.74	0.026	0.021	1.25	0.64	4– N
Tensile (Threadless)	1" Rd.	6	0.38	0.71	0.026	0.027	1.23	0.64	7– N
Repeated Impact	7/8" Rd.	4	0.40	0.63	0.022	0.013	1.24	0.64	4– N
(1/8" Radius)	7/8" Rd.	5	0.40	0.62	0.026	0.016	1.24	0.64	3–4 N
Repeated Impact	7/8" Rd.	1	0.38	0.62	0.033	0.022	1.31	0.51	*5–6 N
("V" Notch—1/4" Radius)	7/8" Rd.	0	0.38	0.55	0.030	0.021	1.36	0.54	5–6 N
Izod (Tensile)	7/8" Rd.	—	0.35	0.54	0.019	0.019	1.19	0.66	–
Izod (Notched Bar)	5/8" Rd.	A	0.41	0.65	0.018	0.022	1.20	0.71	7– N
	5/8" Rd.	B	0.41	0.66	0.018	0.023	1.21	0.73	7– N
	5/8" Rd.	C	0.38	0.67	0.018	0.024	1.20	0.73	7– N
	5/8" Rd.	D	0.41	0.64	0.019	0.023	1.20	0.73	7– N
	5/8" Rd.	E	0.41	0.65	0.018	0.023	1.15	0.69	7– N
	5/8" Rd.	F	0.41	0.65	0.018	0.022	1.22	0.73	7– N

*Some large grains at surface.
N = Normal.

as possible in applying the load to the axle. As a regular production design axle is used as a test specimen, the concentration of stress should be the same as it is in service. The stress is varied from almost zero to the maximum. The only way in which this test does not simulate service conditions is in the speed of application of the stress, which is probably too low.

Various formulas for a "merit index" have been proposed, but the author considers them unsatisfactory for determining the optimum hardness of the material or the best type of material to be used for any given purpose. Obviously, for any given steel, there will be only one hardness which will have the highest merit, and this hardness should be used whether the article to be made is a steering knuckle, an axle, or a part subjected only to tensile stresses.

In order to determine the best hardness for tractor axle shafts when made of the steel used in production, all of the tests described were performed on S.A.E. 3140 steel. Chemical analysis and McQuaid-Ehn grain sizes of the steels tested are given in accompanying table. All of the data obtained in the earlier tests are plotted in Fig. 2.

The first series of repeated impact tests were made on specimens having a groove of 1/8-in. radius, and the plot showed a decided peak at 415 Brinell. From these results it seems that the optimum hardness depends upon the degree of concentration of stress. There is undoubtedly some concentration of stress at the roots of the splines of the production axles, intermediate between that of the tensile specimen and the Izod notched bar; consequently, it would be expected that the optimum hardness would also be at some intermediate figure. Results of the torsion fatigue test indicated that the optimum hardness lies between 415 and 495 Brinell.

In order to secure more data bearing on the question as to whether the optimum hardness is a function of the concentration of stress, another series of repeated impact bars were made with a 1/4-in. radius and two sets with 1/32-in. radius. As was expected, the peak on the repeated-impact curve with the large radius came at a higher hardness, and with the smaller radius at a lower hardness than that already determined with the specimens having the 1/8-in. radius groove. The difference in hardness at which these peaks appeared was comparatively slight. All tests were run in duplicate, and it was therefore thought that even this slight difference substantiated the principle that concentration of stress affects the optimum hardness.

From all of the tests made it seemed that the optimum hardness for this particular axle when made of S.A.E. 3140 fine grain steel is 400-550 Brinell.

In practice the fracture is started at least by a single torsion impact, and the author therefore subjected steels of the specification given and of various degrees of hardness to a torsion-impact test. One conclusion reached from the results of these tests was that the design of the specimen has a pronounced effect on the results obtained. The author believes that while the principle of the torsion-impact test is sound, in applying its results to engineering problems, the relation of the design of the specimen to that of the production part must be taken into consideration. This, however, applies equally to all other tests discussed.

Torsion-impact tests were made also on production axles (Type B, Fig. 1). The torsion impact was applied to the axle by dropping a 9000-lb. hammer on the end of a 15-in. lever, which transmitted the blow through a spline chuck to the small splines of the axle. The large splines were held stationary in a splined chuck at the other end of the fixture. The results of this test are shown in Fig. 3.

In these tests the axles were submitted to a series of blows from successively greater heights, until the axle failed. Both the maximum height of drop and the energy absorbed in breaking the axle were computed. The latter

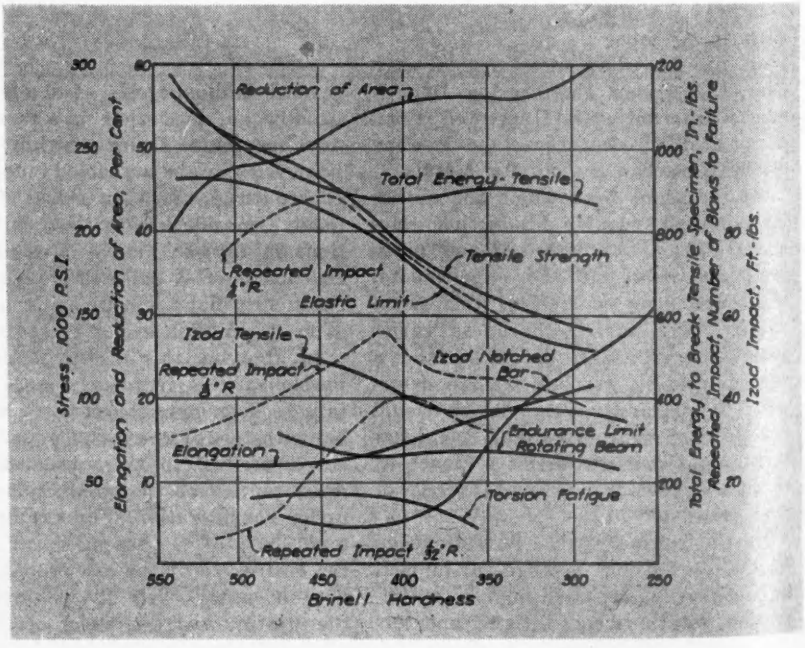


Fig. 2—Physical properties of SAE 3140 steel (Elastic limits were determined from stress strain diagrams.)

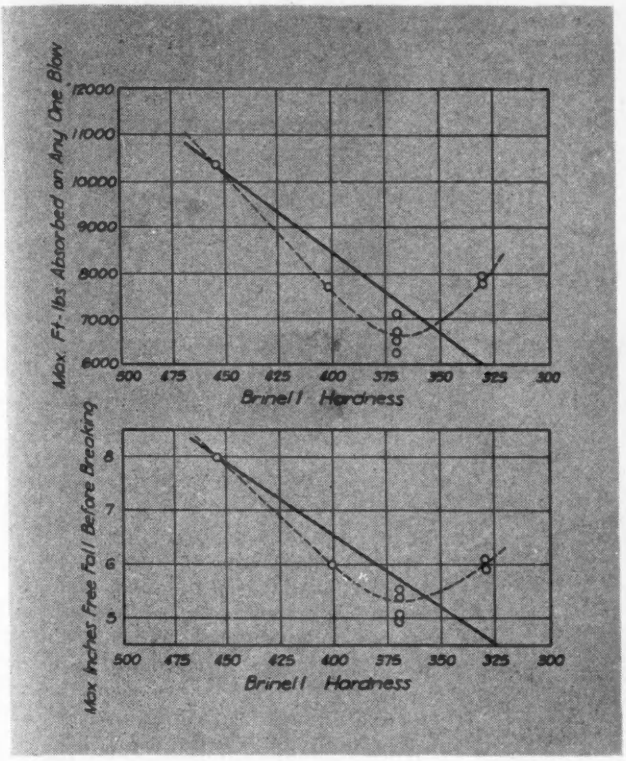


Fig. 3 — Torsion impact results of Type "B" axles by falling weight method

was accomplished by measuring the velocity of the falling hammer before and after breaking the axle.

From these results it would seem that the optimum hardness for these axles is 450 Brinell or higher. One point, however, must be taken into consideration, and that is that the speed of the falling hammer never exceeded 4½ m.p.h. The fractures produced more nearly simulated those of static torsion than those of torsion fatigue or service failures.

It was also noted that even though the axle was broken by a single blow, it always suffered a twist in the large soft section. In service it is possible for these axles to be submitted to a shock corresponding to a velocity of 18 m.p.h. at a distance of 15-in. from the center of the axle. Whether the velocity of application of the load has any effect on the result was not definitely proven by the tests so far conducted; it is suggested by the author, however, that high velocity of application may increase concentration of stress where the design is such that some concentration already exists.

Design of axles was also discussed by the author, who said that although the primary duty of the engineering metallurgist is to select steel, prescribe heat treatments, and specify physical properties, the question of design cannot be overlooked by him. The design should be as economical as possible without decreasing the practical life of the axle. In one point the design of tractor axles may differ from that of axles for trucks and passenger cars: The weight of the axle is not so important in the case of tractors, but the total cost should be kept down.

It is obvious that there must be localized stresses at the roots of the splines. Truck and passenger-car axles are usually designed so that there is a neck near the spline end, which is smaller than the pitch diameter and sometimes smaller than the root diameter of the spline portion. Such a design may cause the failures to occur in the neck rather than in the spline. It has been found, however, that when some of the tractor axles are designed this way, the strength as determined by the static torsion test is somewhat lower. It may be that such an axle would have a higher resistance to shock and fatigue, although this point has not been definitely established. It must also be remembered that producing a neck in the axle, either by forging or machining, may mean an increase in the cost of the product.

Considerable attention was given in the paper to the merit of plasticity in permitting the yielding of the more highly stressed fibers. Plastic flow, however, can occur only when these highly stressed fibers are loaded beyond their elastic limit. It may be more desirable to design the axle so that a similar amount of deformation can take place below the elastic limit. In other words, a long slender axle may actually be stronger in service than a shorter one of a larger diameter, in spite of the apparent higher strength of the latter.

Sloan Answers FTC

(Continued from page 814)

"Therefore, for a long time, General Motors, through its subsidiary, the General Motors Acceptance Corp., was striving to develop a formula whereby anybody and everybody could determine, through some simple calculation, the total charge involved in any financing transaction. As a result, about a year ago there was evolved what was styled, the 'Six Per Cent Time Payment Plan.' The consumer immediately benefited on two counts—first, the cost of financing was again lowered, and second, the cost could be determined by anybody who could multiply.

"At the time that the new plan was announced, I sent a message to General Motors stockholders, and in that message I made the following statement: 'This six per cent flat multiplier is not six per cent interest,' and in the announcements and advertisements of General Motors Acceptance Corporation, the greatest care has been exercised to distinguish between six per cent as a multiplier, and the possible assumption on the part of some purchasers that the six per cent meant six per cent true interest. It certainly does not; was never contemplated so to do. That would be economically impossible. The facts have been stated time and time again. That is the argument, and the sole argument.

"Now, here is a case where an industry has conscientiously tried to do a better job and has used its ingenuity to continually reduce the price of time financing in the interest of the consumer. That, the record amply demonstrated. It now develops a formula so plainly expressed that anybody can remember and thus easily determine, for his own protection, what the total cost of the financing deal should be, yet that industry is attacked on the technical point that some people may assume that this formula, which has contributed so much to stabilizing the financing of new motor cars, and has saved the consumer millions of dollars, is not what it is intended to be.

"The above are the facts as to the controversy and are submitted so that the public can judge as to the merits of the argument in their own interest."

New DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Headstock

Porter-Cable Offers Device for 9-in. Mfg. Lathe

Developed to facilitate rapid turning, facing and boring of small precision parts, the high speed headstock produced recently by the Porter-Cable Machine Co., Syracuse, N. Y., practically makes their 9-in. manufacturing lathe a new machine.

The spindle is mounted on precision, high-speed, pre-loaded bearings provided with force feed lubrication. Bearings in the headstock are mounted so as to allow the rear bearing to float and this arrangement, it is claimed, compensates for varying lengths of bearing centers due to temperature changes.

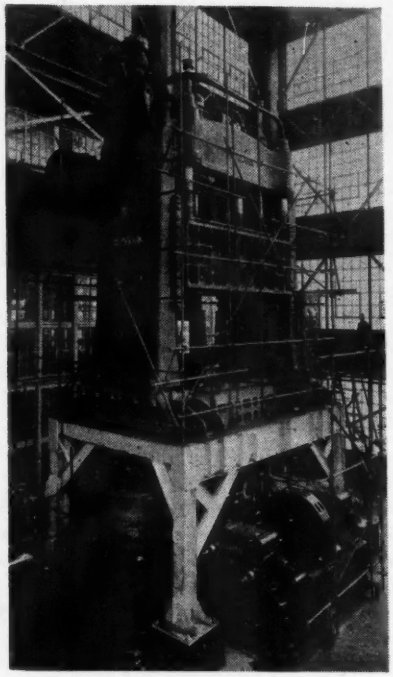
Spindle speeds up to 3600 r.p.m. may be obtained by the use of different size motor pulleys or variable speed motors; feeds ranging from 0.0005 in. to 0.010 in. are made possible by means of pick-off gears.

The machine is said to be especially suitable for second operation work with tungsten carbide, stellite, or diamond tools.

1000-Ton Body Press

Southwark Machine Has Direct-Acting Hydraulic Cylinders

A 1000-ton triple-acting hydraulic press for the Fisher Body Corp., Cleveland, was recently completed by the Baldwin - Southwark Corp., Philadelphia.

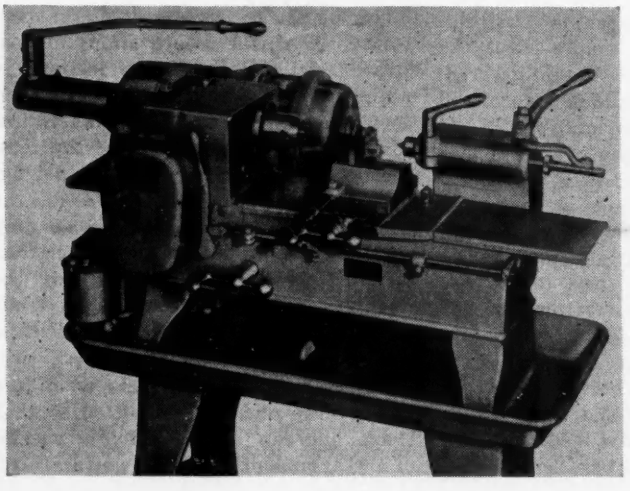


Baldwin-Southwark body press

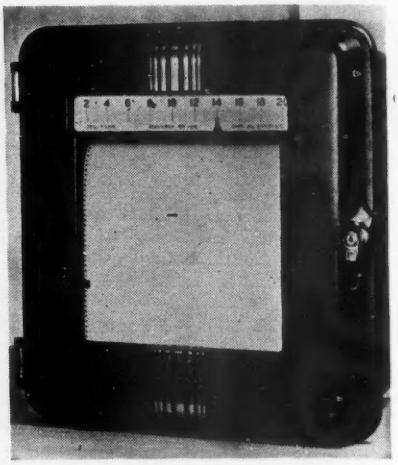
The press utilizes direct-acting hydraulic cylinders—a relatively new development in triple-action presses. Four screw stops on the outer slide allow a varying amount of clamping pressure to be applied at each of the four corners; four cylinders are employed, each with a 42-in. stroke and yielding 400 tons. Cylinders acting upon the inner slide produce a pressure totaling 600 tons. A maximum working stroke of 62 in. is available in the inner slide.

The bottom action, which has a 10-in. stroke, consists of two cylinders of 400 tons total. This is used as the third action.

Other dimensions include a clear distance of 191 in. between the slide housings, while the vertical "daylight" of the inner slide is 140 in., slide up.



Porter-Cable 9 in. lathe with high-speed headstock



Micromax recorder

Die Springs

New Danly Product Subjected To Special Heat-Treating Process

Danly Machine Specialties, Inc., Chicago, has announced a new type of flat rounded die spring. The new spring is coiled from keystone wire which, when coiled, assumes a rectangular cross section, developing the full strength of the wire and increasing flexibility, travel and fatigue life.

Coiling is done by completely automatic machinery. Following the coiling operation, each spring is heat-treated by a special process, utilizing three-zone furnace control and fixed oil quenching temperature.

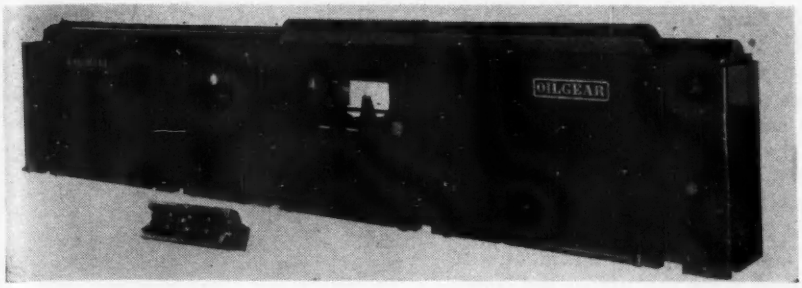
Springs are laid flat on a furnace conveyor and brought up to temperature in the furnace. They are then quenched in an oil bath of fixed temperature without exposure to the air. Next they are carried to other furnaces where the final phases of the drawing operation are completed; following this they move to the japanning ovens.

This heat-treatment is said to develop practically absolute uniformity in hardness and temper.

Recorder

Another Industrial Recording Machine by Leeds & Northrup

The "Silver Anniversary" Micromax recorder has been announced by Leeds & Northrup Co., Philadelphia, Pa.



Oilgear horizontal surface broaching machine

This Micromax not only provides in the one instrument all combinations of indicating, recording, signalling and controlling, but provides these functions in ways unique to this model. Measurements are presented most conveniently; a bold scale and pointer shows the condition at the moment, and a clear record on ten visible inches of strip-chart shows it for the past several hours. On controllers, a second pointer shows control setting. Multipoint records may be in blue or in multi-color.

Vernier Height Gage

Starrett Device for Inspection of Jigs and Fixtures

The L. S. Starrett Co., Athol, Mass., has developed the No. 454 vernier height gage for inspection of jigs and fixtures. An application of the instrument to the final inspection of a jig for automotive production is illustrated. The gage shown has a range of 18 in., but 24 and 46 in. gages can be supplied.

The bar is graduated on one side only to read by means of a vernier to 1/1000 in. from 0 to 18 in.

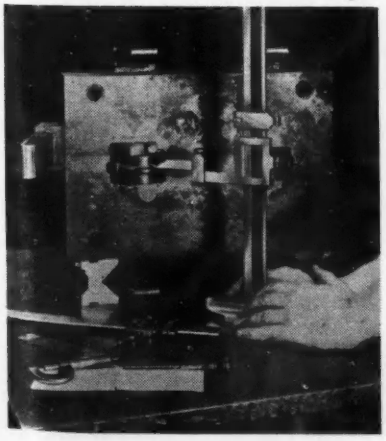
Broaching

Large Oilgear Machine For Engine Blocks

A large horizontal surface broaching machine for rough and finish broaching the sides and bottom of the main bearing cap surfaces that meet with the web of the crankcase in 8-cylinder engine blocks has been built recently by the Oilgear Co., Milwaukee, Wis.

Engine blocks are carried to and from the machine by a conveyor. The operator moves the engine block from the main conveyor onto a short conveyor in the machine and trips a level which automatically locates and raises the block through a hydraulic cylinder and toggles to the broaching position. Another small level securely clamps the block in place. Then the main control lever is tripped and fluid power moves the long slide and tools across the block at the rate of 10 blocks per hr.

This machine has a normal broaching capacity of 40,000 lb., a stroke of 130 in., a broaching speed of 24 ft. per min. and a return speed of 60 ft. per min.



Starrett height gage

Improved Resins

General Plastics Improves Armature Impregnating Solutions

For the impregnation and coating of motor and generator armatures, General Plastics Inc., North Tonawanda, N. Y., has developed several improved thermosetting resin solutions. Instead of being dependent upon mere oxidation as is the case in oil varnishes, these resins form a permanent and infusible film by chemical reaction. Other advantages claimed for the resins are higher insulation and greater resistance to water, oils and chemicals, plus a stronger bond between wires and armature frames, which prevents the wires from throwing out at high speed. Metal castings are also treated with these resins to reduce porosity, subsequent baking hardening the resin.

Communication

Intra-Department System by Bell Said to Use Radio Principles

Bell Sound Systems, Inc., Columbus, O., has announced a new intra-department communicating system, trade named "Belfone," which is said to incorporate certain principles of radio, using an amplifier, microphone and loudspeaker.

With a box approximately the size of the smallest midget radio placed on the desk or counter, one just flips a key and talks in a normal voice. Amplified and received by a combination of loudspeaker and microphone, the person at the other end distinctly hears and replies. A volume control and two different types of loudspeaker permit the voice received to be of any degree of loudness for the quick communication with a party at various places in the department. Even though a person may be standing 25 or more feet from the receiver his reply, in a normal voice, will be picked up and transmitted.

By a combination of two or more of these systems it is claimed that a number of simultaneous conversations can take place by means of a selector key.

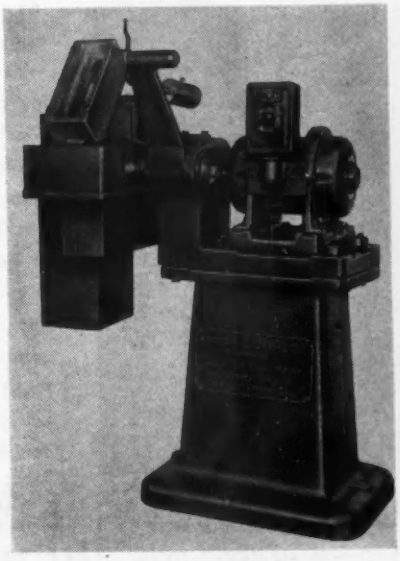
Tool Crib Cutter

Wet Abrasive Type Machine For Smaller Sized Materials

A tool crib cutter, the No. 0, for cutting practically all types of materials of the smaller sizes—solid bar materials up to ⅝ in. square or round, and tubing up to 1¼ in. in diameter—has recently been announced by the Andrew C. Campbell Div. of American Chain Co., Inc., Bridgeport, Conn.

Although the machine is the wet cutting type, it can be used either wet or dry and is readily adjusted so that varying amounts of coolant can be used.

The cutting is done by a revolving thin abrasive disk which picks up the proper amount of coolant from the coolant tank. This revolving disk carries the coolant up into the area inclosed by the wheel guard where it is distributed both on the periphery and the sides of the cutting disk.



Campbell tool crib cutter

Disks up to 12 in. in diameter and 1/16 in. to ⅛ in. can be used. These are mounted on a spindle which is equipped with grease-sealed ball bearings.

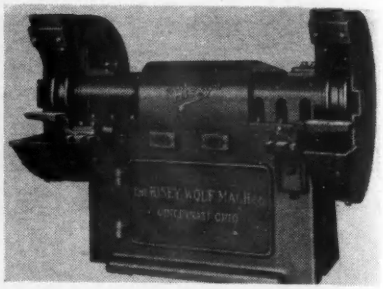
Snagging Grinders

Line of Heavy-Duty Machines Announced by Hisey-Wolf

A new line of heavy duty Texdrive snagging grinders has been developed by the Hisey-Wolf Machine Co., Cincinnati, O. These machines are made in four sizes, 5, 7½, 10 and 15 hp., and 15 different types consisting of single spindle grinders, multi-speed grinders and two-spindle grinders with one or more speeds.

The two-motor, two-spindle grinder is said to be the most efficient in that the speed of either spindle can be changed independently to suit size of wheel. On single spindle machines with multi-speed drive the size of the larger wheel naturally determines the operating speed for safety reasons.

The Hisey system of wheel transfer employs groups of single speed grinders arranged in sets for different size wheels. For example: Grinder No. 1 is equipped with 30-in. wheels and with speed to suit. When a wheel on grinder No. 1 is worn to 24 in. it is removed for transfer to grinder No. 2 which has guards and speed for 24-in. diameter wheels. When a wheel on machine No. 2 is worn to 20 in. it is again removed for transfer to machine No. 3.



Hisey-Wolf snagging grinder

Flanges for large hole grinding wheels are made for wheels with 10, 12 and 20 in. holes. Grinding wheels with large holes are more economical as an allowance is made according to the size of the hole.

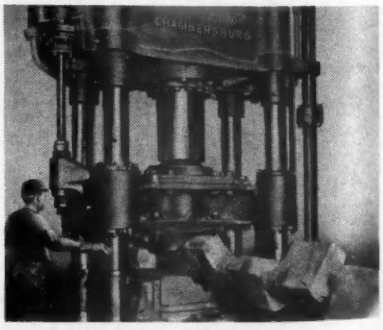
Forging Presses

High-Speed Steam-Hydraulic Units Built by Chambersburg

High-speed, steam-hydraulic forging presses have recently been added to the line of the Chambersburg Engineering Co., Chambersburg, Pa. These presses are manufactured and sold by the Chambersburg Co. by arrangement with the United Engineering and Foundry Co., Pittsburgh, and under Davy Bros., Ltd., patents.

Two general styles are available, the single-frame and the four column models. Both embody the same principles and application, the difference being only in capacity and physical features. Essential elements are the press, the steam intensifier and the water reservoir or prefiller tank.

Close control of the intensifier or forging stroke is said to be attained by the controlling gear attached to the intensifier which operates to close the steam valve at a point of the intensifier



Chambersburg forging press

because it is
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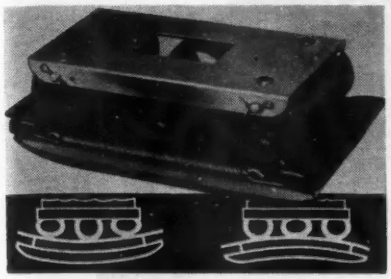


Sterling sanding and rubbing device

stroke corresponding to the position of the hand level. A slow movement of the hand lever results in a correspondingly slow squeeze of the press, and stopping the movement arrests the action of the press.

The single-frame press is built in 150-ton and 300-ton sizes. The four-column model is built as a single-cylinder press up to the 1500-ton size and a duplex ram press from 2000-ton capacity upwards.

Sanding and Rubbing

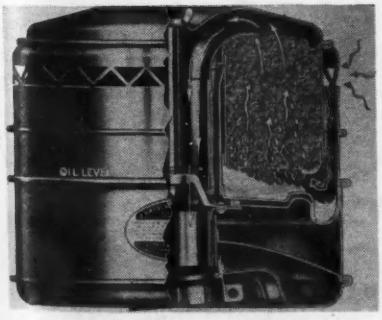
Portable Electric Machine Has Reciprocating Action

An electric sanding and rubbing machine of reciprocating action has been developed by the Sterling Products Co., Detroit. Sanding action is reciprocal with ⅝ in. travel of the sanding pad, at speeds ranging from 1750 to 2800 complete oscillations per min.

It is said that, due to the patented "floating" feature, there is no restriction in the movement of the block and that the machine is applicable to curved and flat surfaces.

The device is designed for wet or dry sanding and finishing as a water connection is provided with a series of openings on each side of the block to supply a spray that is adjustable to the job requirement. For gas sanding with naphtha, gasoline and benzine, a special block with sterlite base is provided.

The machine is portable and is driven by electric motor through a flexible shaft. Three different types of mountings are provided: a bench type, the ceiling suspended type and a bench height pedestal.



Burgess air cleaner

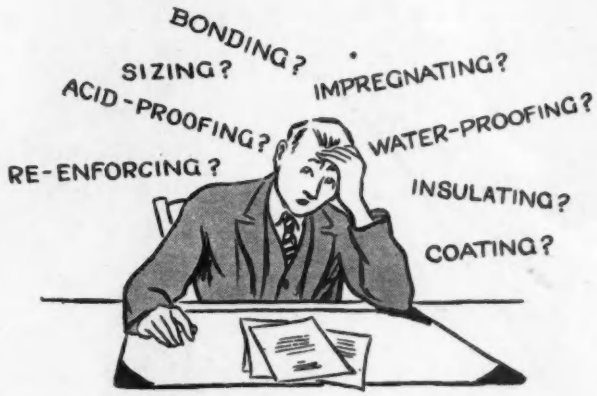
Oil Bath Air Cleaner

Easily Serviced Unit Developed By Burgess

The Acoustic Div. of the Burgess Battery Co., Madison, Wis., has developed an oil bath cleaner and silencer. The unit is designed so that the oil bath may be removed without removing the silencer from the carburetor. A vertical-type unit is illustrated; the oil bath can be supplied with a horizontal silencer where head room is not available for the type shown.

It will be seen from the illustration that all incoming dirty air must come into contact with the spray of oil. The filter element is positioned so that the relation of the filter to the oil level is constant. Clean air connections are sealed to prevent leakage between the filter and carburetor.

The impingement filter element is said to be highly efficient and the manufacturer points out that the filter unit requires no servicing—only the oil in the sump needs to be changed at regular intervals.



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Durez resins aren't a cure-all for every problem but they do have a host of uses in the automotive industry. In powder, solution or liquid form, these phenol resins set up infusibly by chemical reaction, and resist oil, grease, alcohol, heat, acids, caustics, solvents, moisture and frictional wear. For example, their use in brake linings is largely responsible for the squeakless, long-wearing and uniformly smooth linings in use today.

If you have a problem where you think one of the many forms of Durez Resins might improve on present materials, write us about it, giving as much information as possible. General Plastics, Inc., 212 Walck Road, N. Tonawanda, N. Y.

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